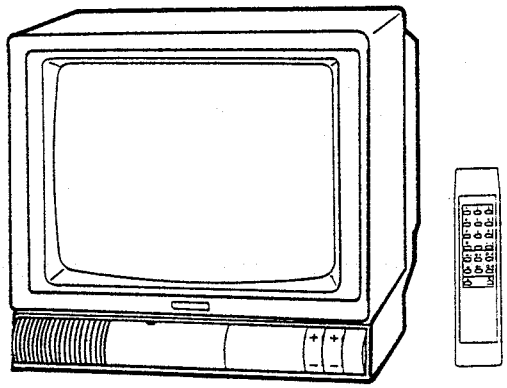
COLOR TELEVISION SERVICE MANUAL



CHASSIS NO. C-41
PAL/SECAM SYSTEM

SPECIFICATIONS

Power Input	AC 220V, 50Hz
Power Rating	(14") 67 Watts, (20") 74 Watts
Tuning Method	Voltage Synthesizer Tuning System
Television System	PAL/SECAM-B/G
Receiving Channels	VHF Channels: 2 to 12 UHF Channels: 21 to 69 Cable Channels: S1'-S3', S1-S10, S11-S20
Antenna Terminal	75 Ohm Unbalanced Type for VHF/UHF
Picture IF Carrier Frequency	38.9 MHz
Sound IF Carrier Frequency	33.4 MHz
Color Sub-Carrier Frequency	34.47 MHz, 34.65 MHz, 34.494 MHz
Sound Output	1.0 Watts (at 10% THD)
Speaker	3 Watts 8 Ohm
Picture Tube	(14") A34JLL70×01 (20") A48JLL70×02
Dimensions	(14") W×H×D=368×341.5×377 (20") W×H×D=598×458×478

WARNING

The chassis in this receiver is hot. Use an isolation transformer between the line cord plug and power receptacle, when servicing tis chassis.
To prevent electric shock, do not remove cover. No user-serviceable parts inside. Refer servicing to qualified service personnel.

SAFETY INSTRUCTIONS

WARNING: BEFORE SERVICING THIS CHASSIS, READ THE "X-RAY RADIATION PRECAUTION," "SAFETY PRECAUTION" AND "PRODUCT SAFETY NOTICE" ON PAGE 2 OF THIS MANUAL.

■ X-RAY RADIATION PRECAUTION

1. Excessive high voltage can produce potentially hazardous X-RAY RADIATION. To avoid such hazards, the high voltage must not be above the specified limit. The nominal value of the high voltage of this receiver is 24.5kv (20"; 25.5kv) at zero beam current (minimum brightness) under 220V AC power source. The high voltage must not, under any circumstances, exceed 25.0kv (20"; 27.5kv). Each time a receiver requires servicing, the high voltage should be checked following the HIGH VOLTAGE CHECK procedure on page 4 of this manual. It is recommended the reading of the high voltage be recorded as a parts of the service record. It is important to use an accurate and reliable high voltage meter.
3. The only source of X-RAY RADIATION in this TV receiver is the picture tube. For continued X-RAY RADIATION protection, the replacement tube must be exactly the same type tube as specified in the parts list.

■ SAFETY PRECAUTION

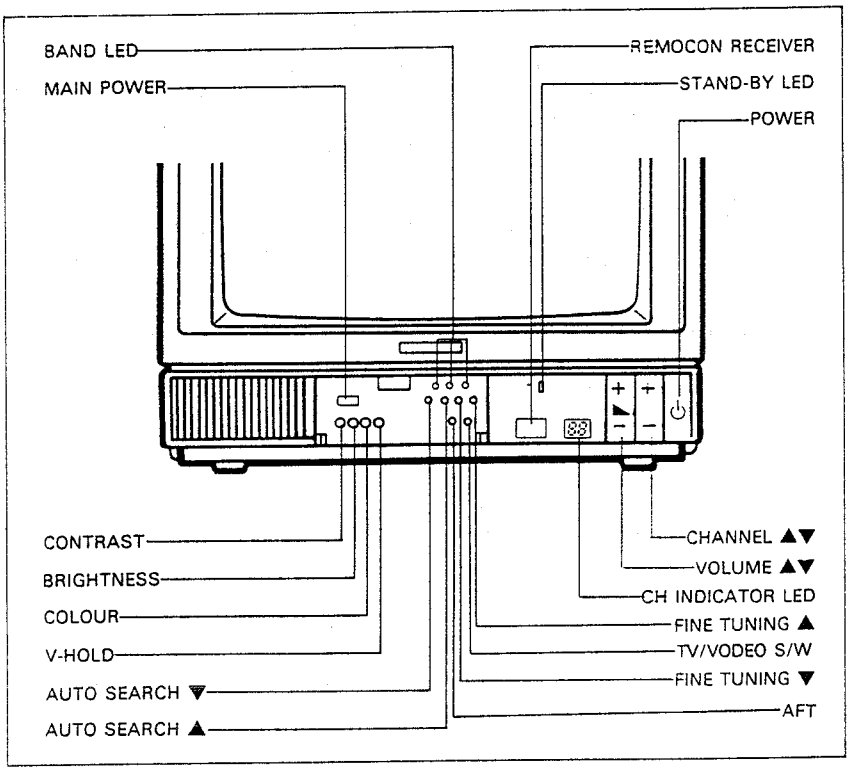
1. Potentials as high as 23,000 (20"; 25,000) volts are present when this receiver is operation. Operation of the receiver outside the cabinet or with the back board removed involves a shock hazard from the receiver.
   1) Servicing should not be attempted by anyone who is not thoroughly familiar with the precautions nesessary when working on high-voltage equipment.
   2) Always discharge the picture tube anode to the receiver chassis to keep off the shock hazard before removing the anode cap.
   3) Perfectly discharge the high potential of the picture tube before handling the tube. The picture tube is highly evacuated and if broken, glass fragments will be violently expelled.
2. If any Fuse in this TV receiver is blown, replace it with the FUSE specified in the Replacement parts list.
3. When replacing a high wattage resistor (oxide metal film resistor) in circuit board, keep the resistor 10mm away from circuit board.
4. Keep wires away from high voltage or high temperature components.
5. This receiver must operate under AC 220 volts, 50Hz NEVER connect to DC supply or any other power or frequency.

■ PRODUCT SAFETY NOTICE

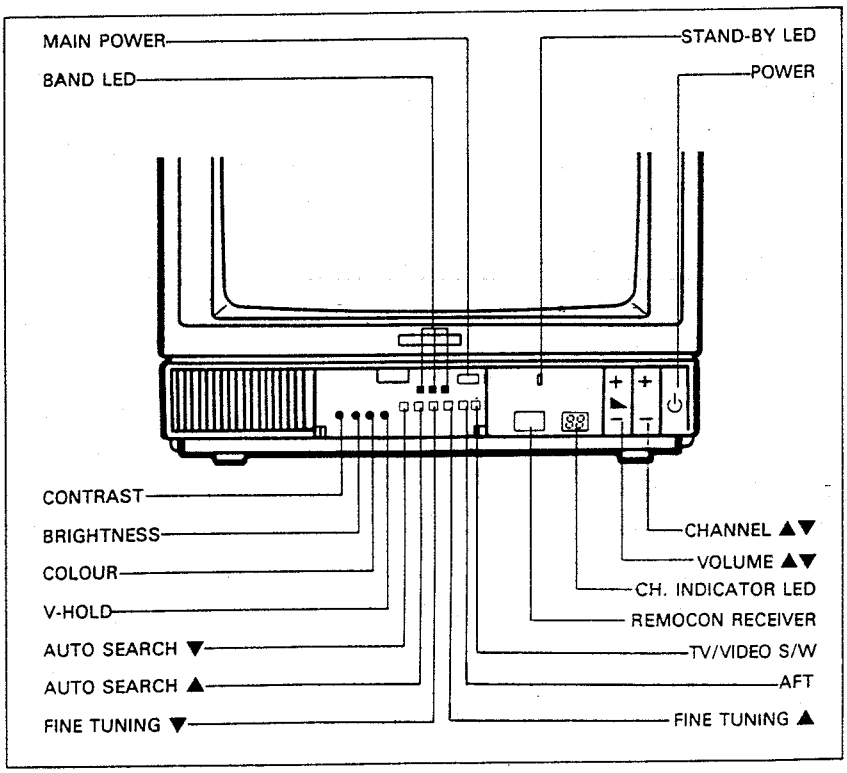
Many electrical and mechanical parts in this chassis have special safety-related characteristics. These characteristics are often passed unnoticed by a visual inspection and the X-RAY RADIATION protection afforded by them cannot necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this manual and its supplements, electrical components having such features are identified by shading on the schematic diagram and the parts list.
Before replacing any of these components, read the parts list in this manual carefully. The use of substitute replacements parts which do not have the same safety characteristics as specified in the parts list may create X-RAY RADIATION.

LOCATION OF CONTROL

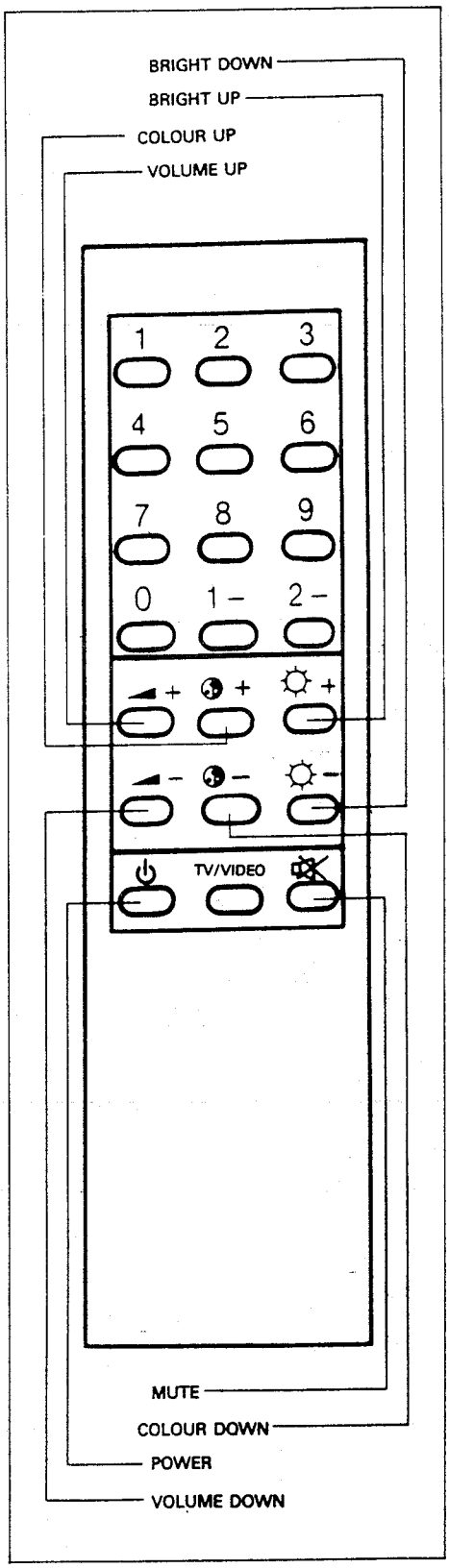
• 14 INCH FRONT PANEL



• 20 INCH FRONT PANEL



• REMOTE CONTROL UNIT



INSTALLATION AND SERVICE ADJUSTMENTS

WARNING: BEFORE SERVICING THIS CHASSIS, READ THE "X-RAY RADIATION PRECAUTION," "SAFETY PRECAUTION" AND "PRODUCT SAFETY NOTICE" ON PAGE 2 OF THIS MANUAL.

GENERAL INFORMATIONS

All adjustments are thoroughly checked and corrected when the receiver leaves the factory. Therefore the receiver should operate normlly and produce proper colour and B/W picture upon installation. However, several minor adjustments may be required depending on the particular location in which the receiver is operated.

This receiver is shipped completely in cardboard carton. Carefully draw out the receiver from the carton and remove all packing materials.

Plus the power cord into a convenient 220 volts 50Hz AC two pin power outlet or frequency.

Turn the receiver ON and adjust the FINE TUNING for best picture detail.

Check and adjust all the customer controls such as BRIGHTNESS, CONTRAST and COLOUR Controls to obtain natural colour or B/W picuture.

AUTOMATIC DEGAUSSING

A degaussing coil is mounted around the picture tube so that external degaussing after moving the receiver is normally unnecessary, providing the receiver is properly degaussed upon installation. The degaussing coil operates for about 1 second after the receiver is switched ON. If the set is moved or faced in different direction, the power switch must be switched off at least 10 minutes in order that the automatic degaussing circuit operates properly.

Should the chassis or parts of the cabinet become magnetized to cause poor colour purity, use an external degaussing coil. Slowly move the degaussing coil around front of the receiver and slowly withdraw the coil to distance of about 2 m before disconnecting it from AC source. If colour shading still persists, perform the COLOUR PURITY ADJUSTMENT and CONVERGENCE ADJUTMENTS procedures, as mentioned later.

HIGH VOLTAGE CHECK

CAUTION: There is no HIGH VOLTAGE ADJUSTMENT on this chassis. The + 103 volt power supply must be properly adjusted to insure the correct high voltage.

1. Connect an accurate high voltage meter to the anode of the picture tube.
2. Turn on the receiver. Set the BRIGHTNESS and CONTRAST Controls to minimum (zero beam current).
3. High voltage will be measured below 24.5kv (20"; 25.5kv).
4. Rotate the BRIGHTNESS Control to both extremes to be sure the high voltage does not exceed the limit of 25.0kv (20"; 27.5kv), under any conditions.

HORIZONTAL OSCILLATOR ADJUSTMENT

If there is an indication of unstable horizontal sync, adjust the HORIZONTAL HOLD Control (R451) to remove the condition. Adjust the HORIZONTAL HOLD to the centre of the pull-in range.

V-CENTER ADJUSTMENT

1. Tune in a PAL RETMA signal.
2. Adjust the vertical center (R353) to the center of retma signal.

H-HOLD ADJUSTMENT

1. Tune in a PAL RETMA signal.
2. Adjust the hrizontal center (R412) to the center of the retma signal.

VERTICAL OSCILLATOR ADJUSTMENT

HEIGHT Control (R352) on MAIN Board changes the size of the picture or pattern, having an equal effect on the top and bottom. Make final adjustment to overscan the mask 2cm at top and bottom.

FOCUS ADJUSTMENT

Adjust FOCUS Control on FOCUS PACK for well defined scanning lines in the centre area on the screen.

DELAYED R-F AGC ADJUSTMENT

1. Tune the set in the strongest station in your area.
2. Turn AGC DELAY Control (R152) on MAIN Board to fully counterclockwise position.
3. Adjust AGC DELAY Control clockwise until noise (snow) disappears on the screen.

AFT (Automatic Fine Tuning) FIELD ALIGNMENT

1. Tune the set to an active channel and adjust fine tuning for best picture.
2. Press and release AFT button, and adjust Coil (T102) on MAIN Board for best picture. Picture quality should be the same as that obtained in Step 1.
3. Check the AFT action by using the fine tuning up/down button and AFT button.

PAL CHROMA ADJUSTMENT

A. COLOUR SYNC ADJUSTMENT

1. Tune in a colour bar signal.
2. Cut off the colour killer by connection of PIN2 and PIN12 of IC501 with 10K ohm resistor. (Set the contrast, brightness, colour controls to maximum)
3. Short L552 to ground with a Jumper Wire.
4. Adjust R552 so that the colour bar pattern stands still or drifts slowly across the picture screen.
5. After adjustment, remove the jumper wire and resistor.
6. Check that the colour sync is stable with channel changing and power on-off operation. If the colour is slow to appear or the colour sync is out of order, retouch the colour sync R552 for proper colour display.

B. COLOUR AMPLITUDE AND PHASE ADJUSTMENT

1. Receiver PAL/DEM signal.
2. Connect the probe of oscilloscope to B-Y output.
3. Adjsut L552 and R551 in order to make wave form flat on screen.
4. Receiver colour bar signal instead of DEM signal.
5. Adjust L551 to make B-Y output stable.

C. PAL COLOUR AMPLITUDE ADJUSTMENT

1. Apply a secam colour bar signal to the ant terminal.
2. Connect a oscilloscope probe to pin 22 of IB01 (M51397 AP)
3. Adjust RB73 to get 3.6Vpp signal (B-Y).

SECAM CHROMA ADJUSTMENT

A. BELL FILTER ADJUSTMENT

1. Apply secam colour bar signal to the ant terminal.
2. Connect a oscilloscope probe to TP B1 on the PCB.
   (Note: The probe should have low input capacitance.)
3. Adjust TB01 for a minimum amplitude modulation of the chroma input signal (Refer Fig. 1).

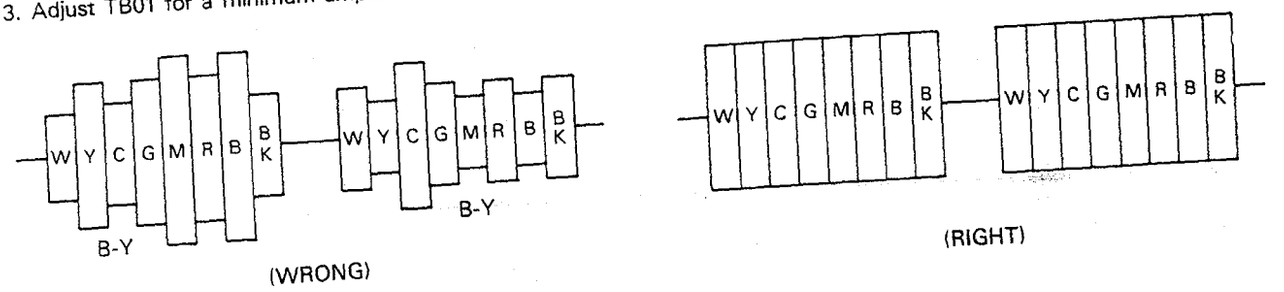


Fig. 1 Bell Filter Adjustment

B. IDENT. COIL ADJUSTMENT

1. Connect a scope probe to pin 16 of IB01 (M51397AP).
2. Adjust TB04 to obtain the highest DC voltage on the scope.
   (Note: Be sure to have correct colour order.)

C. R-Y AND B-Y DISCRIMINATOR ADJUSTMENT

1. Apply secam colour bar signal to the ant terminal.
2. Connect a oscilloscope probe to pin 18 of IB01 (M51397AP).
3. Adjust TB03 to make non color part and horizontal blanking part be on the same level (R-Y). (Refer Fig. 2)
4. Connect a oscilloscope probe to pin 22 of IB01 (M51397AP)
5. Adjust TB02 to make non color part and horizontal blanking part be on the same level (B-Y). (Refer Fig. 3)

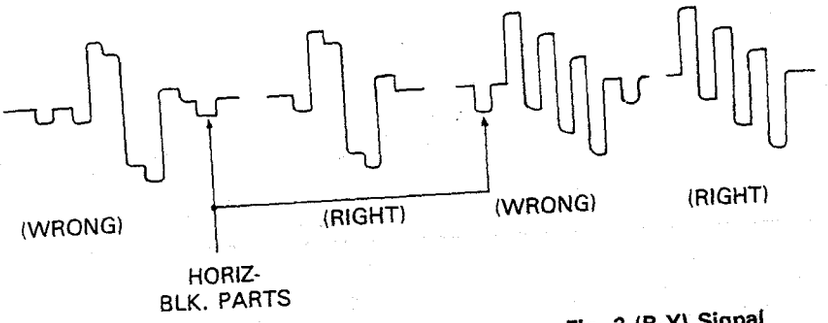


Fig. 2 (R-Y) Signal

Fig. 3 (B-Y) Signal

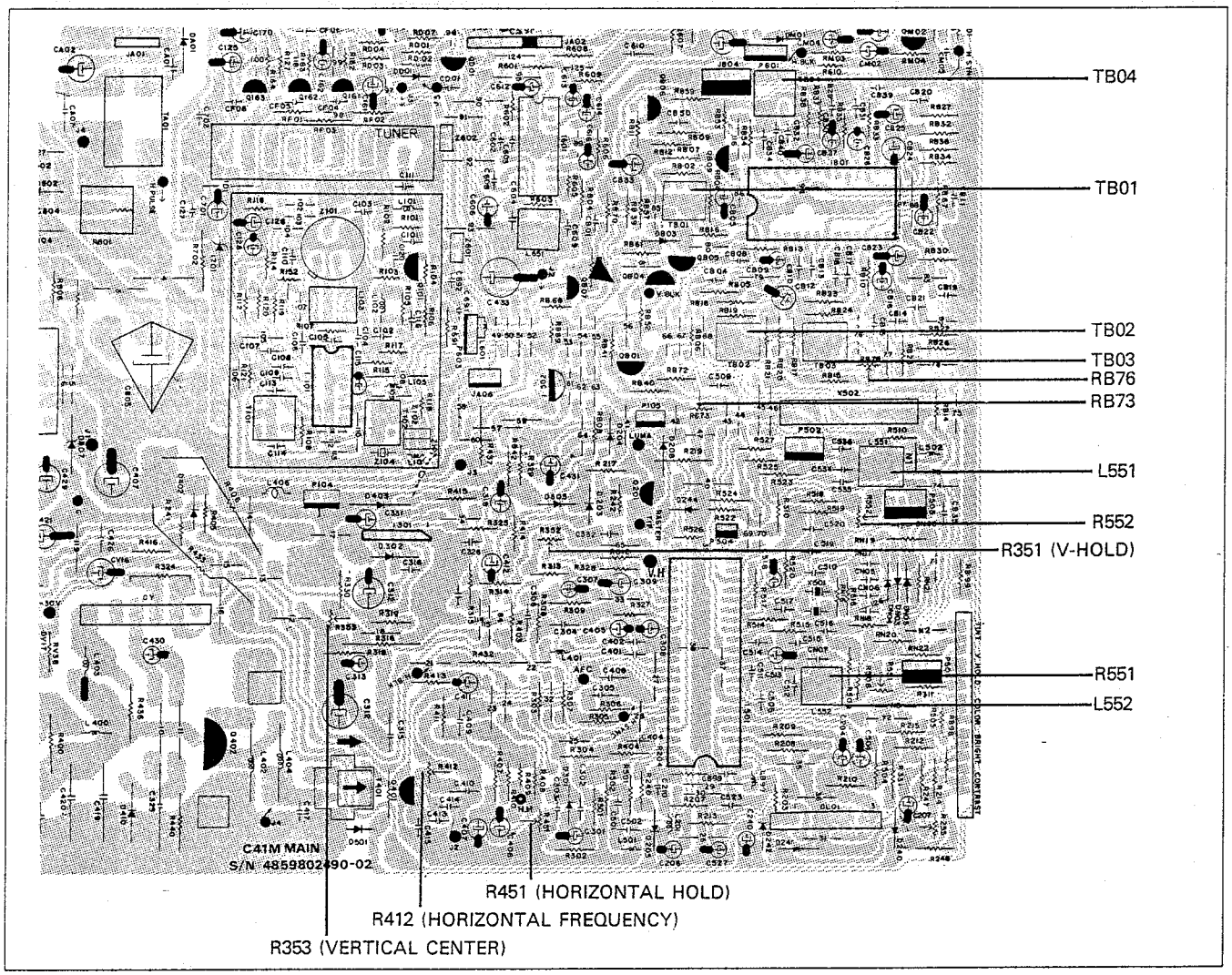
SIF DET. ADJUSTMENT (L651: SIF DET. COIL)

1. Tune in programme which has a pure tone (For example, 400Hz or 1kHz) with SIF carrier.
2. Adjust SIF DET. coil L651 so that the sound output power goes to the maximum.

WHITE BALANCE ADJUSTMENT

The purpose of this procedure is to optimize the picture tube to obtain good black and white picture at all brightness levels while at the same time achieving maximum usable brightness. Normal RF AGC setting and purity adjustment must proceed this procedure.

1. Tune in a monochrome channel and warm up the set for 15 minutes.
2. Set the R.G.B. bias controls (R554, R559, R564) to minimum.
3. Set the G.B drive controls (R560, R565) to the center position.
4. Rotate the screen control fully counter clockwise.
5. Disconnect the luminance output terminal connector (Raster tip) and connect TP S to ground with a jumper wire.
6. Rotate the screen control gradually clockwise until the first horizontal line appears on the screen.
7. If the first horizontal line is red, adjust R559 and R564 to increase the green and blue component level to get a white horizontal line.
8. Remove the jumper wire and connect back the luminance output terminal (Raster tip). Set the BRIGHTNESS and CONTRAST controls at normal positions. Adjust R560, R565 to maintain a good white balance at the brightest part of the screen.
9. Turn the BRIGNTNESS and CONTRAST controls to maximum and minimum. Observe the screen white balance, if it is not proper in high brightness or low brighness condition, adjust R.G.B bias controls or G.B drive controls respecitively in order to maintain a good white balance in both low and high luminance conditions.



CONVERGENCE ADJUSTMENTS

Note: Before attempting any convergence adjustments, the receiver should be operated at least fifteen minutes.

■ Center Convergence Adjustment

1. Receive crosshatch pattern with a colour bar signal generator.
2. Adjust the BRIGHTNESS and CONTRAST Controls for well defined pattern.
3. Adjust two tabs of the 4-Pole Megnets to change the angles between them (See Fig. 5) and superimpose red and blue vertical lines in the Center area of the picture screen. (See Fig. 6)
4. Turn the both tabs at the same time keeping the constant angle to superimpose red and blue horizontal lines at the center of the screen. (See Fig. 6)
5. Adjust two tabs of 6-Pole Magnets to superimpose red/blue line and green one. Adjusting the angle affects the vertical lines and rotating both magnets affects the horizontal lines.
6. Repeat adjustments 3, 4, 5 with understanding red, green and blue moverment, because 4-Pole Magnets and 6-Pole Magnets have mutual affection and it makes dots movement complex.

■ Circumference Convergence Adjustment

1. Loosen the clamping screw of deflection yoke to allow the yoke to tilt.
2. Put a wedge as shown in Fig. 4 temporarily. (Do not remove cover paper on adhesive part of the wedge.)
3. Tilt front of the deflection yoke up or down to obtain better convergence in circurnstance. (See Fig. 6) Push the yoke to fix the yoke temporarily.
4. Put other wedge into bottom space and remove the cover paper to stick.
5. Tilt front of the yoke right or left to obtain better convergence in circumstance. (See Fig. 6)
6. Keep the yoke position and put another wedge in either upper space. Remove cover paper and stick the wedge on picture tube to fix the yoke.
7. Detach the temporarily mounted wedge and put it in another upper space. Stick it on picture tube to fix the yoke.
8. After fixing three wedges, recheck overall convergence. Tighten the screw firmly to fix the yoke and check the yoke in firm.
9. Stick 3 adhesive tapes on wedges as shown in Fig. 4.

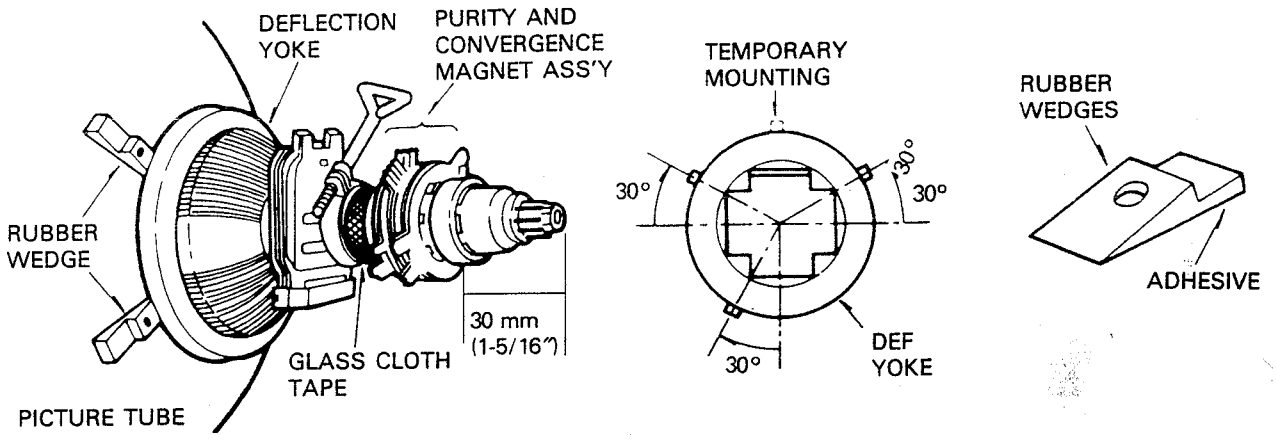
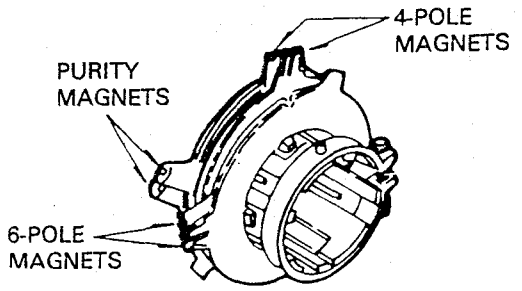
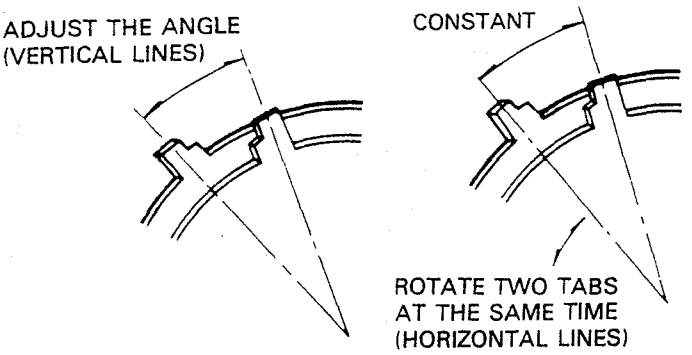


Fig. 4 RUBBER WEDGES LOCATION

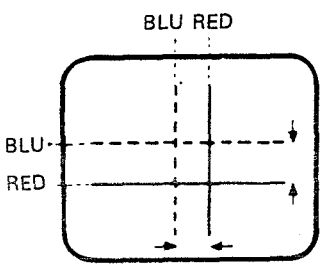


CONVERGENCE MAGNET ASSEMBLY

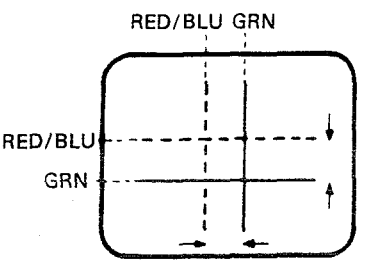


ADJUSTMENT OF MAGNETS

Fig. 5

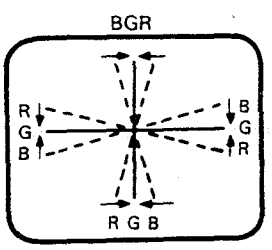


4-POLE MAGNETS MOVEMENT

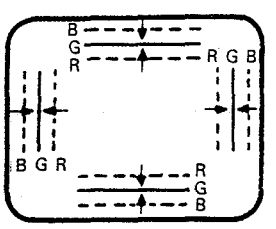


6-POLE MAGNETS MOVEMENT

Center Convergence by Convergence Magnets



INCLINE THE YOKE UP (OR DOWN)



INCLINE THE YOKE RIGHT (OR LEFT)

Circumference Convergence by Deflection Yoke

Fig. 6 Dot Movement Pattern

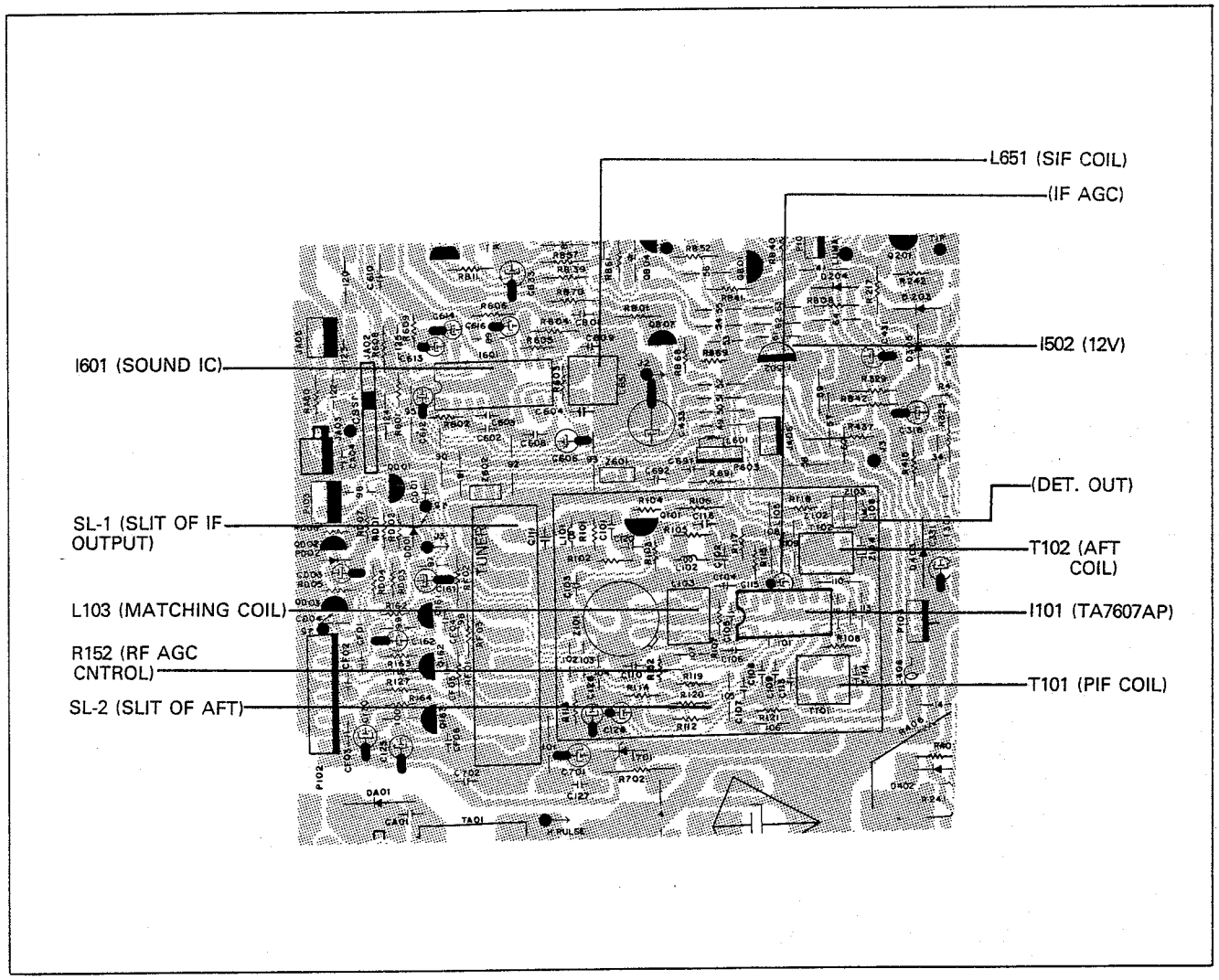
GENERAL ALIGNMENT INSTRUCTIONS

THIS RECEIVER IS TRANSISTORIZED SPECIAL CARE MUST BE TAKEN WHEN SERVICING. READ THE FOLLOWING NOTES BEFORE ATTEMPTING ALIGNMENT.

- Alignment requires an exacting procedure and should be undertaken only when necessary.
- Isolation transformer must be used to prevent shock hazard.
- The test equipment specified or its equivalent is required to perform the alignment properly. Use of equipment which does not meet these requirements may result in improper alignment.
- Correct matching of the equipment is essential. Failure to use proper matching will result in responses which cannot represent the true operation of the receiver.
- Use of excessive signal from a sweep generator can cause overloading of receiver circuit. Overloading should be avoided to obtain a true response curve. Insertion of markers from the marker generator should not cause distortion of the response.
- The AC Power line voltage should be kept 220 volt while alignment.
- Do not attempt to connect or disconnect any wire while the receiver is in operation. Make sure the power cord is disconnected before replacing any parts in the receiver.

TEST EQUIPMENTS

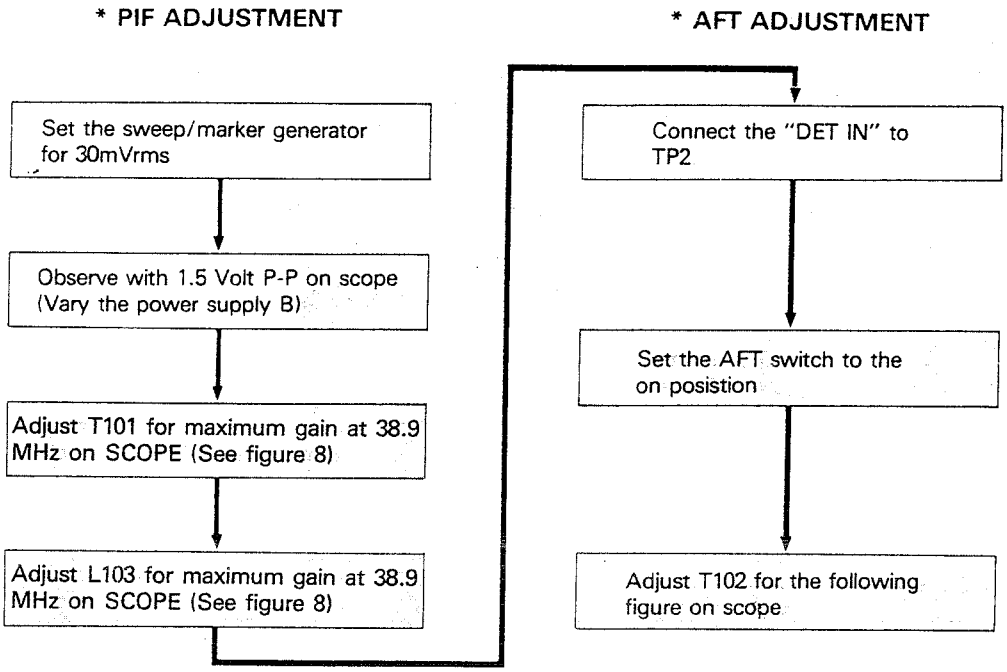
Digital voltmeter	National Model VP-2600A or equivalent.
Oscilloscope	Tektronix Model 2215A or equivalent.
Direct/Low-capacity probe	Tektronix Model P6120 or equivalent. (Accessory of oscilloscope)
Color-Bar/Dot/Crosshatch generator	Tektronix Model 146 or equivalent.
PIF sweep marker generator	Nihon Tsushinki Model 4723 or equivalent.
Power supply	Academy Model 150A or equivalent.
Isolation transformer	Voltage adjustable type having capacity of more than 150 watts.



■ PICTURE I-F SWEEP ALIGNMENT AND AFT ALIGNMENT

- Refer to Fig. 7, 8 and 9 for alignment points and test equipments connections.

1. Open the SLIT-1 (IF output terminal of TUNER) and SLIT-2 (AFT terminal of TUNER).
2. Connect the "Output Terminal" of the sweep/marker generator to the I-F input on Main Board.
3. Connector the "DET IN" with direct probe to TP4 on the Main Board.
4. Supply +12 volt bias to 12 volt line and +8 volt bias to terminal "TP1" on Main Board.
5. Set the AGC DELAY Control (R152) on Main Board fully counterclockwise.
6. Proceed with the alignment steps following the chart below.
7. If the response on oscilloscope appears unstable, disconnect the RF AGC lead temporarily.


* PIF ADJUSTMENT
Set the sweep/marker generator for 30mVrms
Observe with 1.5 Volt P-P on scope (Vary the power supply B)
Adjust T101 for maximum gain at 38.9 MHz on SCOPE (See figure 8)
Adjust L103 for maximum gain at 38.9 MHz on SCOPE (See figure 8)
* AFT ADJUSTMENT
Connect the "DET IN" to TP2
Set the AFT switch to the on posistion
Adjust T102 for the following figure on scope

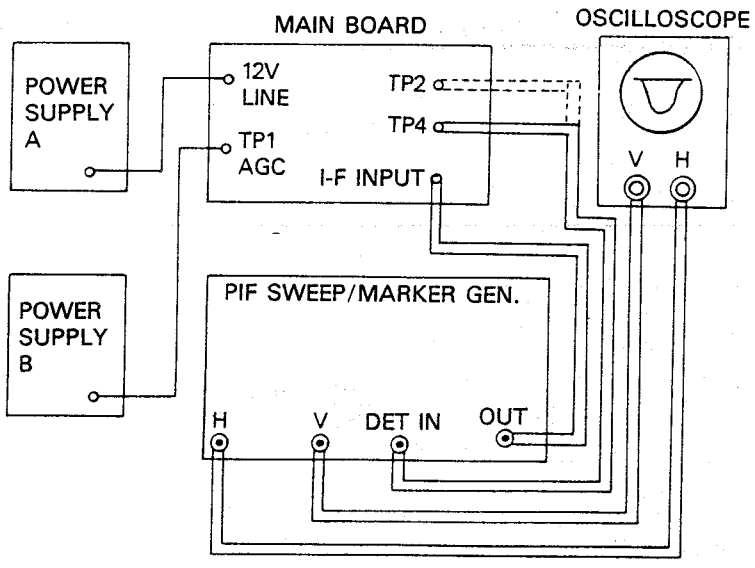


Fig. 7 Picture I-F Sweep Alignment

*** After completing the above steps, disconnect equipment and adjust the AGC circuit.**

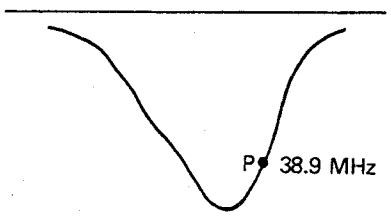


Fig. 8 PIF RESPONSE CURVE

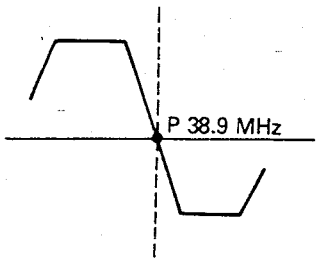


Fig. 9 AFT RESPONSE CURVE

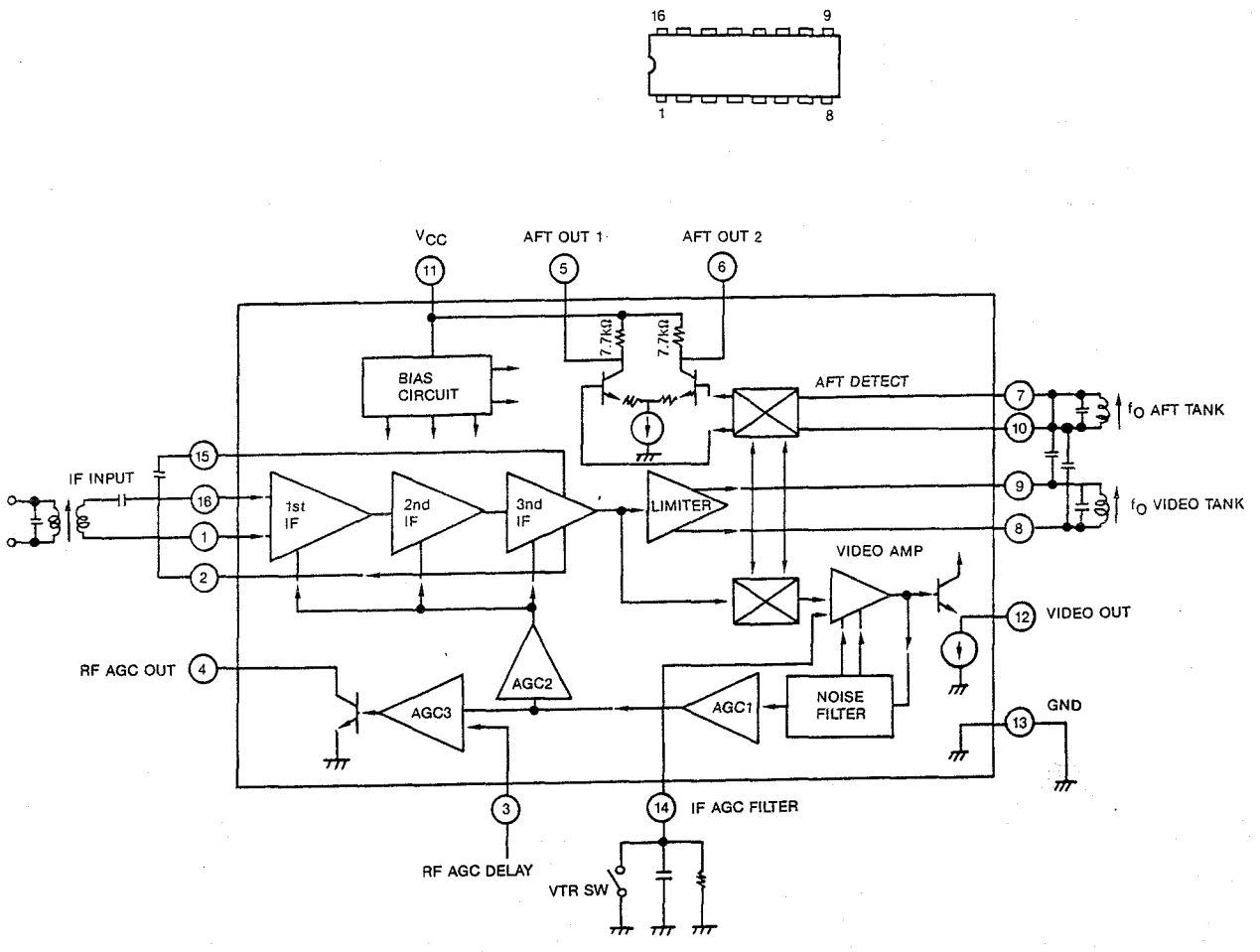
IC OPERATION DESCRIPTION

1. TA7607AP/11AP

(1) Functions of the TA7607AP/11AP

The TA7607AP/11AP is a PIF system IC in a 16 leads dual-in-line plastic package. This device is designed to have wide application capability with minimal external parts and adjustments.
TA7607AP/11AP realizes a PAL system in aconjuntion with the TA7698AP video-chroma-deflection, or an NTSC CTV system with the video-chroma-deflection.

BLOCK DIAGRAM



(2) Operation of the PIF section

The PIF section provides all the function which a PIF stage requires. The difference between the TA7607AP has a reverse RF AGC output for FET top tuner, and the TA7611AP has aforward RF AGC output for a NPN top tuner.

The TA7607AP/11AP realizes a high performance PIF subsystem in a conjunction with a suitable SAW (Surface Acoustic Wave) filter, with minimal external components and adjustments.

Followings are the operation description based on the block diagram.

(a) PIF amplifier is a 3 stage AGC amplifires.

The sensitivity of this stage is 100u Vrms Typ. @58 MHz, or 52u Vrms Typ. @45 MHz.
Terminal #1 and #16 are the input terminals. A single-ended or a differential input conf figuration is capable. Terminal #2 and #15 are the coupling terminals for the intenal bias circuit.

The gain of this stage is controled by the internal peak-value AGC circuit. The output of this stage is connected to the video detector stage internally.

(b) Video Detector

The amplified PIF signal is applied to the video detector.
The picture arrier component is derived from the PIF signal, limited and phase shifted by a tank circuit connected to #8 and #9 terminal to produce a switching carrier for the synchronous video detector.

The SIF is detected at the same time (Inter carrier Detection).

Detected composite video signal is applied to video output stage, AGC circuit and the noise inverter circuit through a part of the video amplifier.

(c) Video Amplifier

The video amplifier consists of a buffer amplifier and an output amplifier which has 6mA output current capability. Therminal #12 is the output terminal for the compostive video signal and the SIF signal.

The composite output signal has 2.5V sync-tip level (Sync negative) and 2Vp-p amplitude. This output is applied to the video inverter amplifier of the video-chroma-deflection IC, and the DC component of the output signal can be a bias source of the sequential amplifier. The composite video signal is also applied to the AGC circuit and the noise inverter circuit internally.

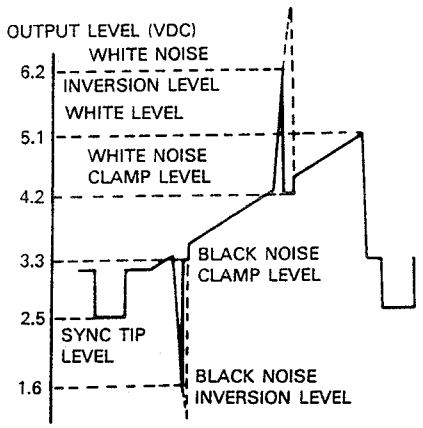
(d) Noise Inverter

Operation level of the internal IF AGC of the TA7607AP/11AP is determined by the sync-tip level mentioned above. If the composite video signal includes black pulse noises which exceeds 2.5V to the minus side, they may cause mis-operation of the AGC, unstability of the synchronization or degradation of the S/N ratio.

Also white pulse noises cause degradation of the S/N ratio.

The TA7607AP/11AP provides noise inverter circuits for both noises to keep a stable operation. A noise which exceeds the threshold level is inverted to a gray level (clamp level).
The relation of the threshold levels and clamp levels are shown below. This inverter circuit performs excellent capability of noises without any external components or control signals.

Video output level and Noise Inversion levels



(e) AGC Circuit

The composite video signal is also applied to the AGC circuit.
The AGC circuit is consist of the internal IF AGC circuit and the RF AGC circuit with the delay point adjustment circuit.

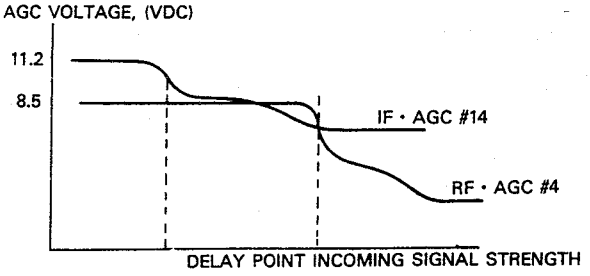
At the input of the AGC circuit, an 12dB/Oct. L.P.F. is equipted to prevent abonormal AGC operation such as AGC latch up caused by excessive SIF signal component or high frequency noise components.

The inernal IF AGC controls the 3-stage PIF amplifier gain.
The total gain control range (or the gain reduction range) is 64dB typ..

The AGC response speed is determined by an external CR value connected to the #14 terminal. If the time constant is too small, it will cause the "zag" during vertical sync period. And if too big, the system will not be able to track rapid input signal level changes such as flattering caused by an airplane and so on.

The #4 terminal is an open-collector RF AGC output terminal.
The starting point of the RF AGC (Delay point) is determined by a D.C. voltage of the #3 terminal. The output polarity of the RF AGC and the IF AGC control voltage change by the input signal level are shown bellow. The TA7607AP is the reverse RF AGC type for an FET top tuner, and the TA7611AP is the forward RF AGC type for an NPN top tuner.

TA7607
AGC Characteristics



(f) AFT Circuit

A multi-plier type phase detector is applied to the AFT detector.
The reference signal is the input PIF signal (limited picture carrier) and the input signal of the AFT detector is derived from the PIF tank and phase shifted by an AFT tank circuit which is connected between the #7 terminal and the #10 terminal.

To keep stable AFT operation, a cross-coupling connection between the PIF tank and the AFT tank is recommendable. This connection is able to cancel or compensate stray capacitances between PIF tank circuit and AFT tank circuit.

Terminal #5 and #6 are the differential AFT output terminals, which enable wide application capability.

2. TA7698AP

(1) Function of the TA7698AP

The TA7698AP combines a PAL/NTSC Video-Chroma sub system and a Deflection combination on a single chip to provide a PAL or a PAL/NTSC color television.

This device includes a Video amplifier, PAL and NTSC color Demodulators designed to provide color differential outputs, an improved Sync-separator, a Horizontal oscillator with saw tooth type AFC, a Horizontal pre-driver with a X' ray protection circuit, a Vertical oscillator and a Vertical pre-driver in a 42-leads dual-in-line plastic package.

The TA7698AP realizes a very simple PAL CTV or a PAL/NTSC dual system CTV in conjunction with the TA7680AP/81AP PIF/SIF combination IC. And also to realize a PAL/SECAM/NTSC multi standard system CTV, a SECAM demodulator and a system switch are required in addition to the above two chips.

Followings are the operation discriptions based on the block diagram.

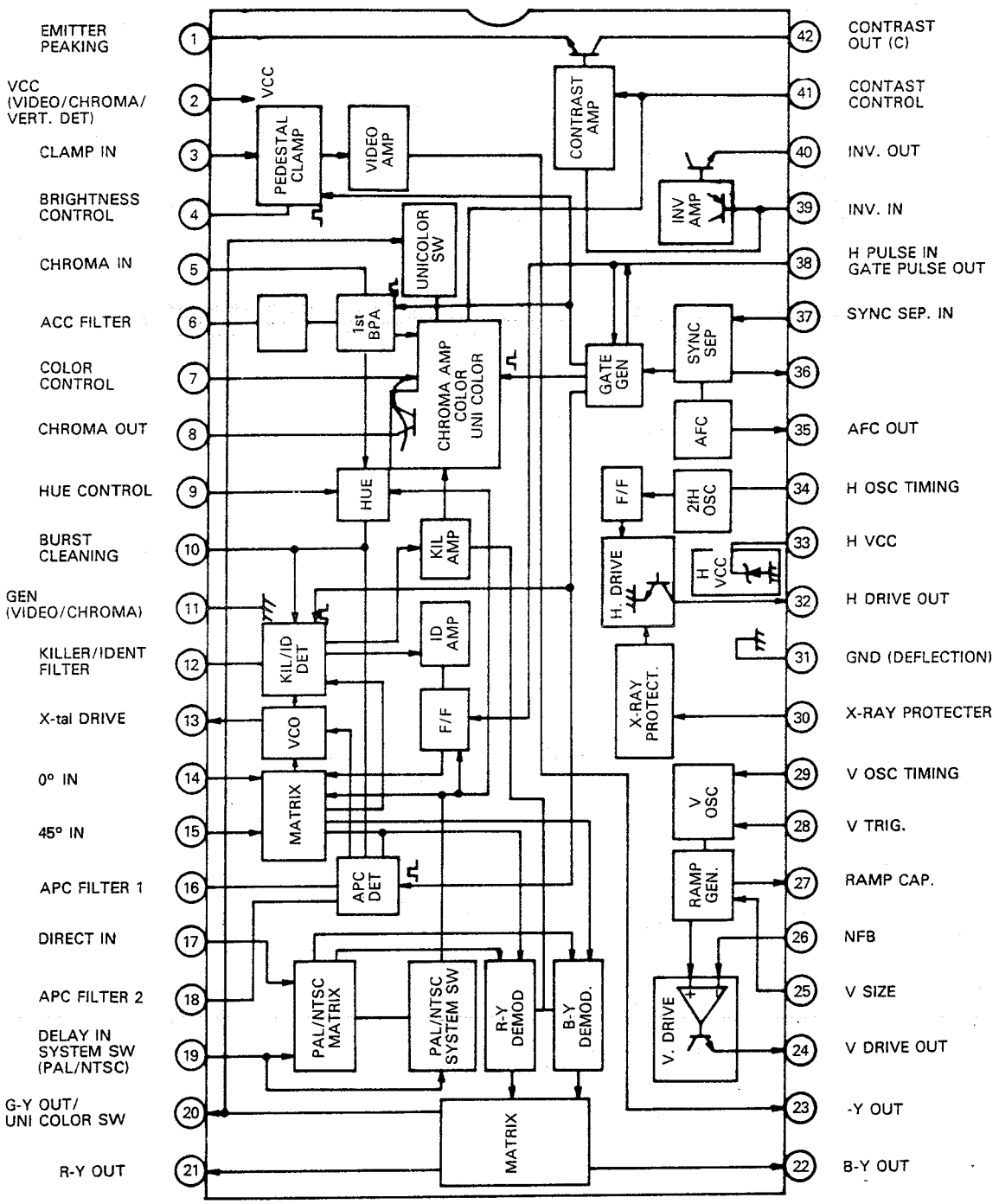
(2) Separation of the Vcc Lines and the GND Lines

The TA7698AP equipts with Vcc lines. One of them are the #2 terminal 12V line for the video-chroma subsystem, the sync separator and the vertical deflection system. The other is #33 8V Vcc line providing an internal zener regulator for the AFC and the horizontal section. This 8V line is driven by the high +B line (+110V to +130V) through a series resistor to start up the system. After setting up the system operation, current from the 12V Vcc line maintains this 8V line power requirement.

And also the TA7698AP equipts separated GND lines. To prevent inter-section interferences each section has it's one GND line. The lins are tied together at the IC GND pad to reduce common impedances. The #11 terminal is a GND line for the video section and the chroma demodualtor, and the #31 terminal is another GND line for the sync separator and the deflection system.

These GND lines are pulled out to each side of the IC package to be minimize the common impedance. Special attentions should be payed to a pattern layout of the external GND line.

TA7698AP BLOCK DIAGRAM



(3) Video Section

(a) Inverter Amplifier

The composite video signal from the output of the PIF stage is applied to the inverter amplifier through a sound carrier trap

The #39 is the input terminal, and the operating bias is derived from the DC component of the PIF output. The input dynamic range is 2.0V to 6.5V typ., and a sync-negative comosite video signal input is required.

The #39 is also the input terminal of the contrast amplifier.

The output terminal of the inverter amplifier is the #40, and the output circuit is emitter follower construction to increase the driving capability. The inverted video output signal is applied to the sync separator and the chroma bandpass amplifier through a chroma signal taking out circuit. The typical gain of the inverter amplifier is 3.5dB.

(b) Contrast Amplifer

The input terminal of the contrast amplifier is also the #39, and a collector output is the #42 and an emitter output is the #1. A frequency dependent circuit is connected to the #1 to obtain the picture control (Peaking Control) function.

The #42 collector output is applied to the pedestal amplifier through a video delay line with subcarrier trap to compensate the group delay difference between the chroma signal and the video signal. The required delay time will be 0.4uS to 0.7uS, and should be adjusted to be optimize the compensation.

The #41 is the control terminal of the contrast control. the minimum 40dB contrast control range is obtained by the #41 DC voltage change 2V to 10V.

When a 2.7kohm resister is connected between the #20 (G-Y Out) and GND, the contrast control also controls the color saturation (Uni-Color Control). And when the #20 is opened, the contrast control is independent.

In other words, when the three color differential outputs are used (PAL or PAL/NTSC application), the contrast control operate as the "Uni-color control". And when two of them, R-Y and B-Y, are used (PAL/SECAM/NTSC APPLICATION), only the contrast is controled. In the later case, a PAL-SECAM system switch IC will control the uni-color function.

(c) Pedestal Clamp Amplifier and the Video Output Amplifier

The output video signal from the contrast amplifier is applied to the pedestal amplifier. The brightness control and the DC restoration (Pedestal Clamp) functions are in this stage.

The processed video signal is fed to the #23 (-Y output).

The #4 is the brightness control terminal. The ABL (Automatic Brightness Limitting) functions is realized also by this terminal.

The DC restoration ratio is variable by superposing the video signal of the #3 to the #4 brightness control terminal.

An PNP transistor is connected between the #23 (-Y output) and the chroma output stage to minimize a switch-on drifting that may be caused by the thermal capacity difference between the IC and the chroma output transistors.

The maximum output amplitude of the #23 (-Y output) is 7.5Vp-p typ. (10% to 90%), and the DC restoration ratio is 70% typ. by external components values given in the block diagram.

(4) Chroma Section

As the TA7698AP provides a CCIR axis PAL chroma demodulator and a NTSC axis NTSC chroma demodulator controled by an internal PAL/NTSC system switch, it realizes wide capability of applications.

(a) The 1st Chroma Bandpass Amplifier

The inverter amplifier output from the #40 is applied to a chroma bandpass filter to take out the chroma information. The chroma signal is applied to the #5 the 1st chroma bandpass amplifier input. The #5 terminal is biased internally.

The 1st chroma amplifier detects amplitude of the burst signal gated from the chroma signal by the burst gate pulse, and controls it's gain to obtain constant burst signal level chroma output (ACC: Automatic Chrominance Control).

The recommendable input level of the #5 (Burst level) is 120mVp-p.

A typical ACC characteristics is shown below.

The #6 is the ACC time constand terminal to detect the burst level.

(b) Chroma Amplifier

The #8 is an emitter follower output terminal of a chroma signal, of which burst component is drawn out by the burst gate and the saturation level is controled by the color control and the uni-color control.

The #7 is a control terminal of the color saturation (chroma amplitude). The control characteristics is shown bellow.

The chroma output of the #8 is applied to the #17 direct signal input, and to the #19 delayed signal input. The amplitude and the phase relation of these two chroma signal sould be adjusted by the external circuits.

(c) Tint (Hue) Control

In case of the NTSC mode, the #9 is a control terminal of the color tint (or hue) by shifting the burst phase applied to the APC circuit. In the PAL mode, this terminal sould be grounded by a capacitor to prevent interferences.

(d) Killer/Ident Detector, Flip-flop

Detecting the burst signal level, the killer detector switches off the operation of the APC and the chroma demodulator (forced B/W mode) when the level is lower than the designed value. And also the ident detector normalizes the phase of the flip-flop driven by the horizontal flyback pulse when in PAL mode.

The #12 is the terminal of a time constant of the killer and ident dtector, and the DC level $V_{\#12}$ to the detectors.

When the B/W signal reception, the $V_{\#12}$ is 8V typ.. And when the color signal is received $V_{\#12}$ increases and killer operation is released.

When there is a disagreement between the PAL burst phase alternation and the flip-flop phase the $V_{\#12}$ decreases and the ident detector normalizes the flip-flop to correct the chroma demodulation.

The #10 the burst cleaner (a tank circuit tuned to the sub-carrier frequency) is connected to the inputs of the detectors to feed a clean brust signal to the detectors. And it is possible to introduce a constant phase shift between the chroma signal and the burst signal by the tank alignment.

(e) APC Detector, VCO, Matrix Circuit

The APC detector and the VCO (or VCXO Voltage Controled X'tal oscillator) generate a sub-carrier frequency coinsident to the burst phase. The phase difference between the output of the VCO and the burst is detected by the APC (Automatic Phase Control) detector and the output controls the frequency and the phase of the VCO. The #16 and the #18 are the APC filter terminals.

The free running frequency of the VCO is adjusted by a trimmer capacitor connected a X'tal in series or a potentio-meter in the APC filter.

The matrix composes the R-Y/B-Y demodulator reference signals having the required phase difference between the burst signal.

(f) PAL/NTSC Matrix, PAL/NTSC System Switch

In PAL mode, the direct signal is applied to the #17 and the delayed signal to the #19. These signals should have the same amplitude and dthe correct phase relation.

The PAL matrix composes the continuous R-Y and B-Y color signals by adding or subtracting the two signals from the #17 and the #19, and reduces the cross-talk between the signals.

The R-Y and the B-Y signals are fed to the chroma demodulator.

In NTSC mode, the input is only the #17, and the NTSC matrix adjust the R-Y and the B-Y color level to the PAL mode's to keep the same demodulated color outputs.

Above mode change is controled by the DC voltage of the #19.

When the V#19 is lower than 2V, the PAL/NTSC system switch turns the system to the NTSC mode. (Actually, only the #19 may be grounded to change the switch.)

The differences between these two modes are listed bellow.

	Relative Amplitude		Relative Phase	TINT	F/F
	B-Y/R-Y	G-Y/B-Y			
PAL	1.78	0.58	±90°	OFF	ON
NTSC	0.95	0.31	105°, 235°	ON	Stop

(g) R-Y, B-Y Demodulator, G-Y Matrix

The R-Y, B-Y color signals from the PAL/NTSC matrix are fed to the R-Y and B-Y chroma demodulator, and demodulated.

The G-Y matrix composes the G-Y color differential signal from the demodulated R-Y and B-Y color differential signals.

These three color differential signals are fed to the chorma output circuit through the CR carrier filters from the #20, #21 and #22 output terminals.

In the chroma output circuit, these color differential signals are matrixed with the -Y luminance signal from the #23 to obtain the R, G and B color primally signal driving a C-CRT.

For the SECAM mode of the multi-system, the #20 G-Y terminal is opened to stop the uni-color function.

(5) Deflection Section

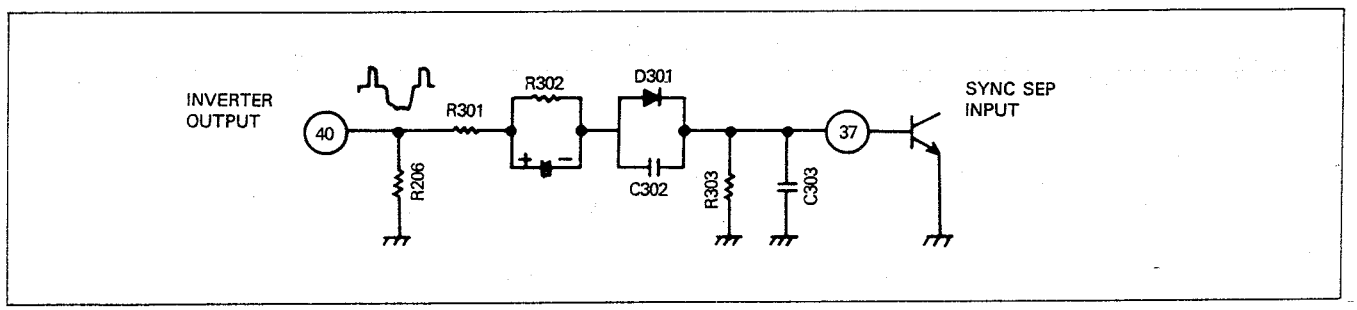
The deflection section of the TA7698AP includes a sync separator, a saw tooth type horizontal AFC, a horizontal oscillator, a horizontal pre-driver with an X'ray protecter, a vertical oscillator and a vertical pre-driver.

The GND line of this section is separated to the other, but the Vcc line except the AFC and the horizontal section is common to the other sections.

(a) Sync Separator

The #37 is an input terminal of the base-time constant type sync separator. The composite video signal from the #10 (Inverter output) is applied through a sync separator time constant circuit.

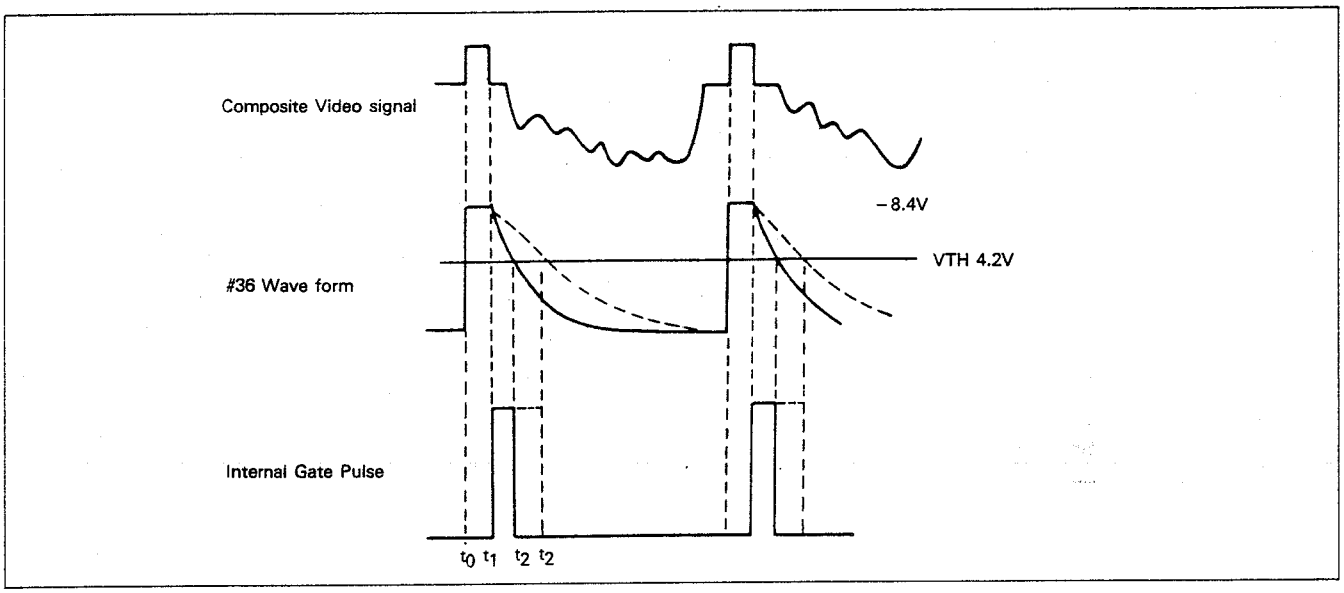
The slice levels of the horizontal sync and the vertical sync can be set independently.



R206 .....#40 load resistor
R301, R303, C302 .....Determines horizontal sync slice level
R301, R302, R301 .....Determines vertical sync slice level
D301 .....Time constant separation
C303 .....Noise filter/Gate pulse rising edge timing

To deepen the slice level;
Horizontal : R301 incrase or R303 decrase
Vertical : R301 increase or R302 decrase

The #36 is the output terminal of the sync separator, and also this terminal is used as a time constant of the internal gate pulse generation.



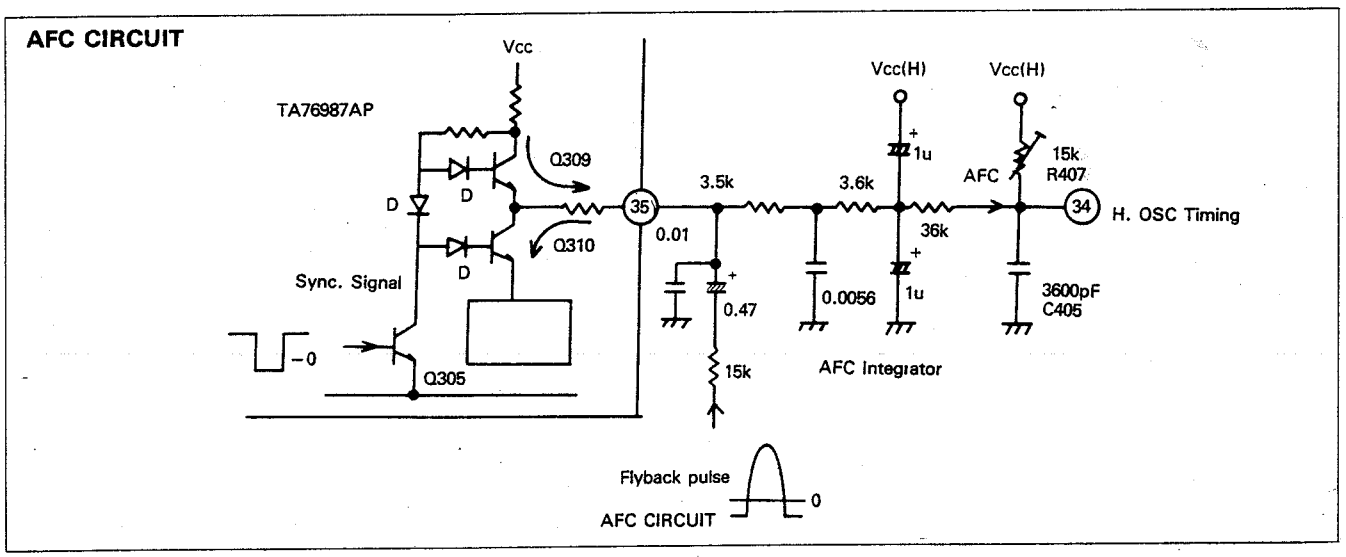
The rising edge of the gate pluse t_{1} is determined internally but little adjustment is possible by the change of C303 connected between the #37 sync separator input and the GND.

The folling edge of the gate pulse t_{2} is determined by an external integration time constant connected to the #36 terminal (This time constant is also for integration circuit of the composite sync output to obtain the vertical sync signal.).

The gate pulse generated here is masked by the flyback pulse from the #38, and is applied to the pedestal clamp circuit and the burst gate circuit.

(b) Horizontal AFC Circuit

The TA7698AP adopts a saw tooth wave type horizontal AFC. A form shaped horizontal flyback pulse is compared to the horizontal sync signal, and the phase difference (Frequency difference) is fed back to the horizontal oscillator so that the fly back pulse will have the same timing as the sync pulse.



Ripple wave of the #35 AFC phase detecter output is integrated by an external CR circuit and the smoothened error voltage is fed to the h. oscillator.

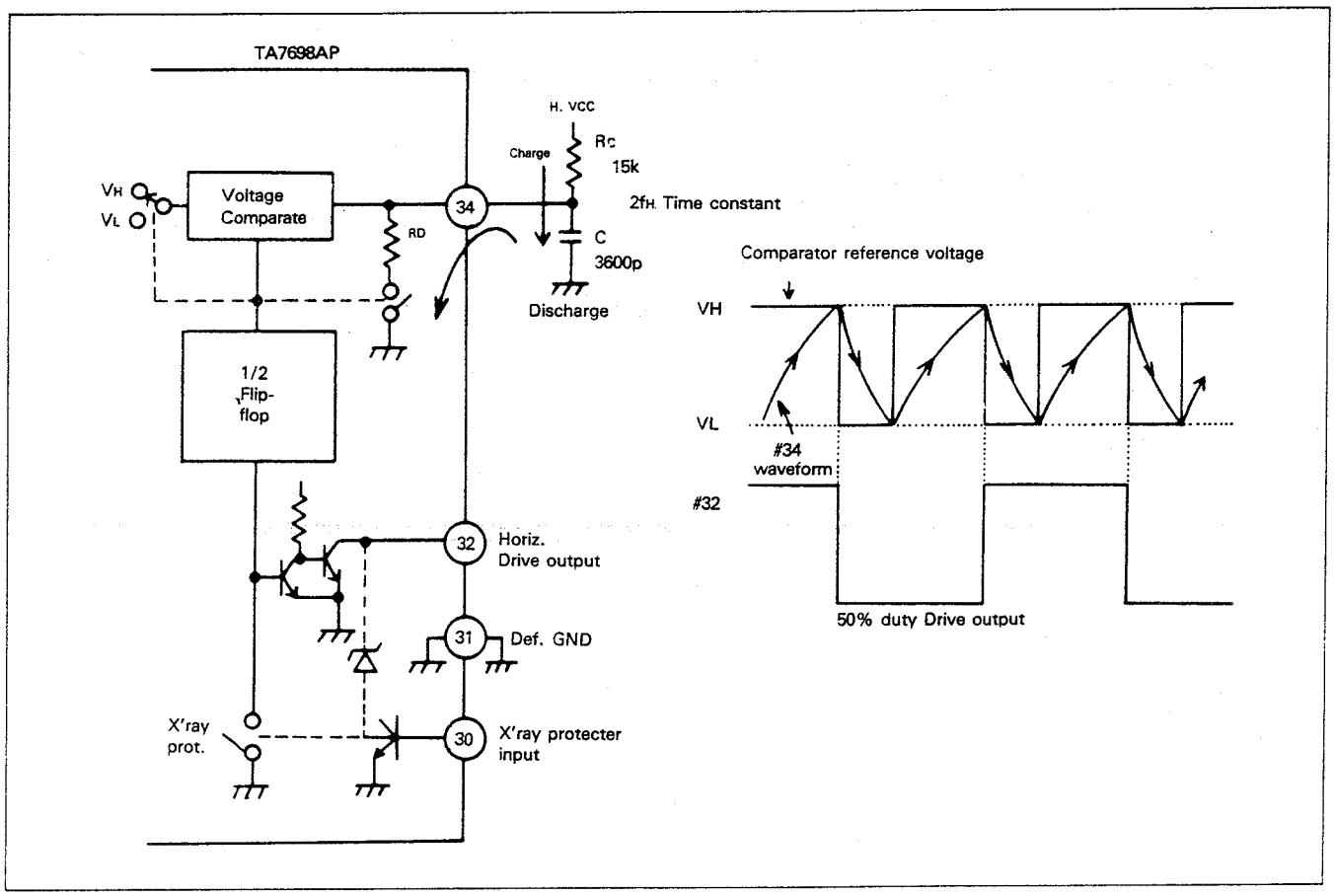
(c) Horizontal Frequency Oscillator and Flip-Flop
Horizontal Pre-driver, X'ray Protecter

The horizontal oscillator generates 2 times of horizontal frequency. The oscillator is a CR charge/discharge type, and is controllator by the AFC circuit. The #34 is a terminal for the oscillator time constant. The free tunning frequency is adjusted by changing the charge resister RC or appling certain DC current to the #34. (The output of the AFC circuit is also applied to this terminal.)

As the $2f_H$ frequency is divided into 2 by a flip-flop circuit, the #32 horizontal drive output has exact 50% duty cycle.

This system realizes excellent inter-lace performance.

The rated sink current of the open collecter output #32 is 30mA peak.



Special attention sould be payed to the pattern layouting and wiring of the #32 horiz. drive circuit and the #31 Deflection GND line because these are large f_H component current pathes.

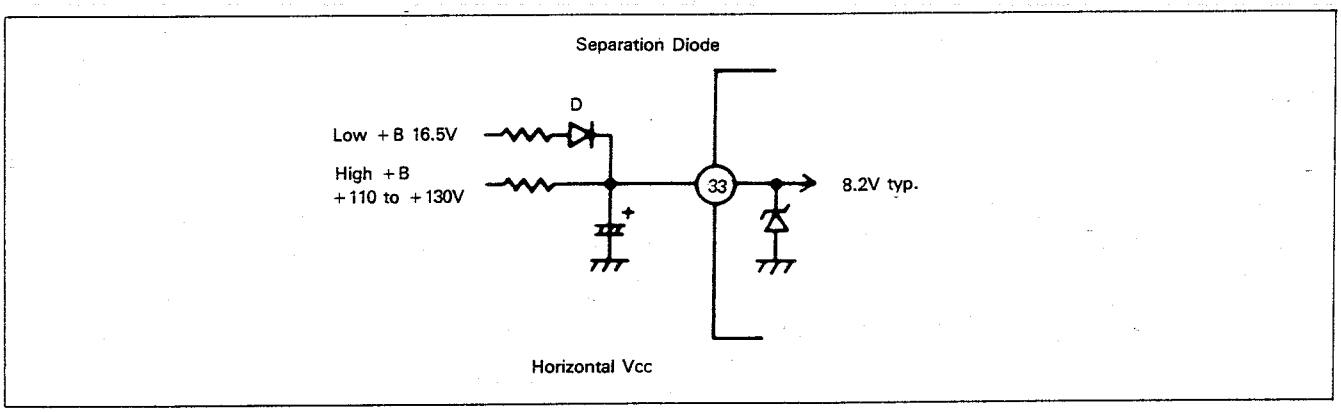
The horizontal drive circuit provides an SCR type X'ray protecter to prevent X'ray radiation from the CRT. The X'ray protecter will operate when the EHV (Extreamly High Voltage for CRT operation) exceeds certain value, and that is determined by external components. Also the X'ray protecter will operate when the #32 voltage exceeds 8.6V typ..

When the X'ray protecter operates the #32 output is shut down to the GND level, and it will not recover before re-switching the power supply.

(d) Horizontal Vcc

As described previously, the supply voltage of the horizontal section is applied from a zener type voltage regulator as shown bellow. When a CTV set is switched on, some supply current which is required to starting up the horizontal section is supplied from the high + B line (+110 to +130V), and then an internal flyback pluse power supply (low + B line 16.5V or 12V) is activated and supports the supply current of the horizontal section.

The internal zener voltage is 8.2V typ.. A diode inserted low + B line is for separation between these two power supplies.



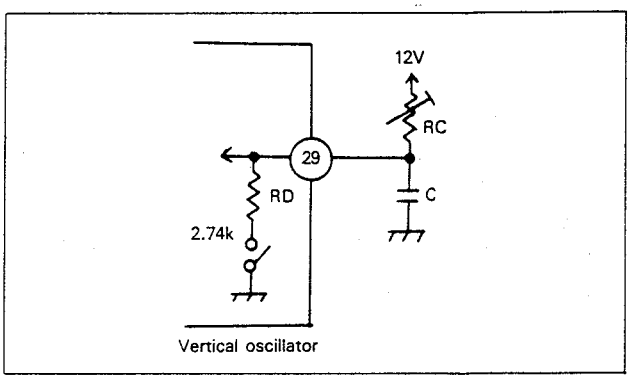
(e) Vertical Sync. Vertical Oscillator

The composite sync output from the #36 is integrated by the external time constant to obtain the vertical sync signal, and the sync signal is applied to the #28 vertical sync terminal.

The vertical oscillator is also an CR charge-discharge type as same as the horizontal oscillator.

The vertical sync pulse re-trigers the oscillation and pull in the frequency to vertical frequency fv.

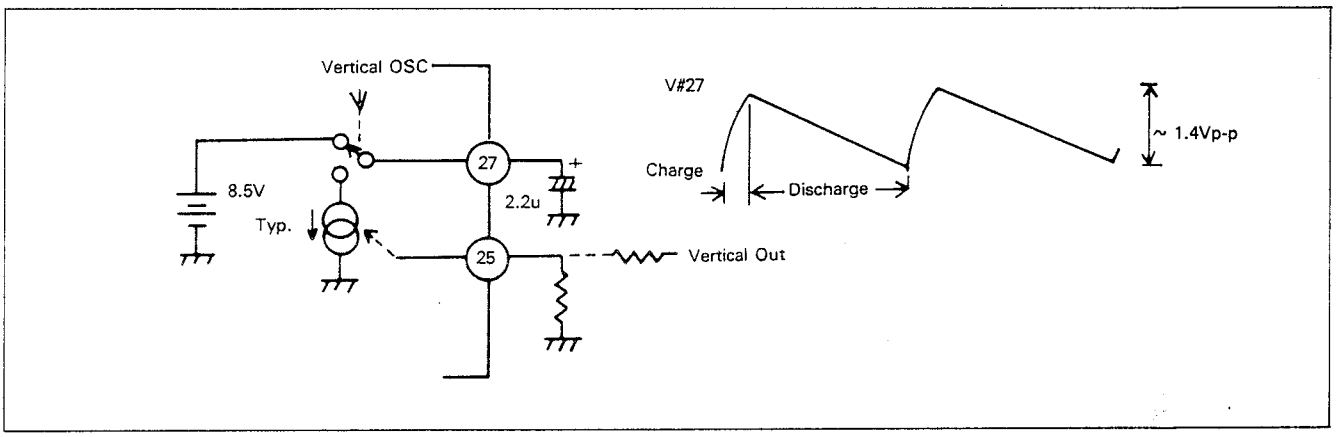
The #29 is for the oscillator time constant. The discharging resister RD is included in the IC. The vertical retrace time is determined by the time constant $C \cdot (RC/RD) = C \cdot RD$.



(f) Ramp Generator

A linear ramp wave is generated by constant voltage charging and constant current discharging a capacitor connected to the #27 terminal. The charge-discharge timing is controled by the vertical oscillator output. The diacharging current is determined by a resister connected to the #25 terminal.

As the vertical output amplitude is proportional to the #27 voltage amplitude, it is possible to compensate the vertical linearity by feeding back the output to the #25 terminal.



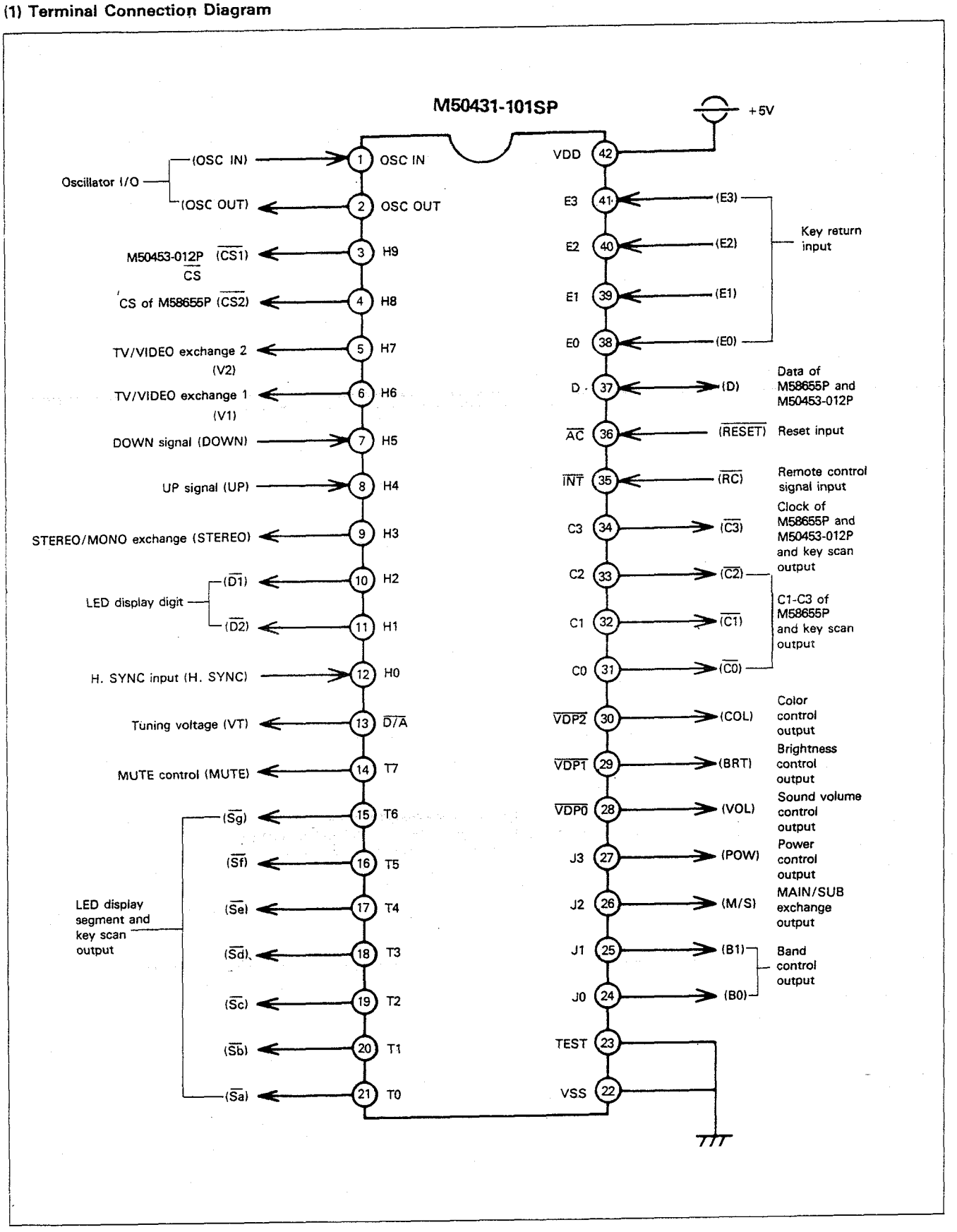
(g) Vertical Driver Amplifier and the Vertical Output Circuit

The vertical output section which is consist of the vertical drive NFB amplifier of the TA7698AP and an SEPP ar an SRPP output stage drives a vertical deflection coil DY so that the current wave form of the deflection coil DY will be similar to the ramp wave from at the #27. A series resister RS converts the DY current wave from to a similar voltage wave form.

And the voltage wave form and the output DC component are applied to the #26 NFB terminal through a ß circuit. The ß circuit determines the output current amplitude and the center voltage.

3. M50431-XXX SP

(1) Terminal Connection Diagram



(2) Terminal Description

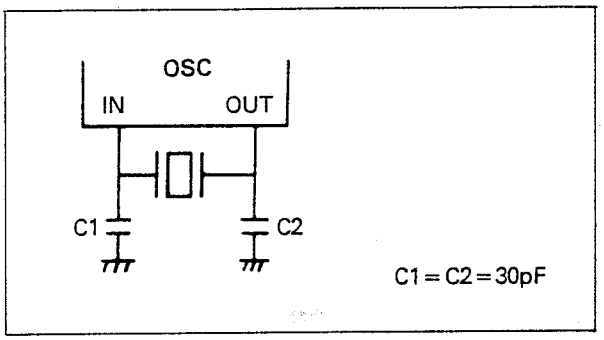
<table>
<tr><th>Pin No.</th><th>Symbol</th><th>Name</th><th>Function Explanation</th></tr>
<tr><td>1, 2</td><td>OSC IN
OSC OUT</td><td>Oscillator
Input/Output</td><td>By connecting the 4 MHz ceramic oscillator and capacitors between the terminals as shown below, the reference clock can be obtained. Since the constant of capacitors and so forth depends on the oscillator in use, use the recommended values of the manufacturer.
 

Fig. 5-1 Example of oscillating circuit by using a ceramic oscillator</td></tr>
<tr><td>3</td><td>SC1</td><td>Chip Select Output of M50453-012P</td><td>This is a chip select signal output terminal for on-screen display IC M5043-012P. The signal goes low when data is transferred to the M50453-012P.</td></tr>
<tr><td>4</td><td>CS2</td><td>Chip Select Output of M58655P</td><td>This is a chip select signal output terminal for an EAROM M58655P. This signal goes low when data is transferred to the M58655P.</td></tr>
<tr><td>5, 6</td><td>V2, V1</td><td>TV/VIDEO Exchange 1, 2</td><td>V1 and V2 are output terminals for exchangeing TV/VIDEO. TV/VIDEO exchanging is controlled by input of TV/VIDEO key as shown below.
<table>
<tr><th>Mode</th><th>V1</th><th>V2</th></tr>
<tr><td>TV</td><td>L</td><td>L</td></tr>
<tr><td>VIDEO 1</td><td>H</td><td>L</td></tr>
<tr><td>VIDEO 2</td><td>L</td><td>H</td></tr>
</table>
When power is OFF, TV mode is set, and when the power is ON, start, start from TV mode.</td></tr>
<tr><td>7</td><td>DOWN</td><td>DOWN Signal Input</td><td>This is input of DOWN signal generated by comparing AFC siganl with the reference voltage, and use for auto-search and digital AFT operation. Input is in active "H".</td></tr>
<tr><td>8</td><td>UP</td><td>UP Signal Input</td><td>This is input of UP signal generated by comparing AFC signal with the reference signal, and used for auto-search and digital AFT operation. Input is in active "L".</td></tr>
<tr><td>9</td><td>STEREO</td><td>Stereo/Monaural Exchange Control Output</td><td>This is a sound exchange signal output terminal. This signal goes high after releasing reset. The signal state rolls over between high and low whenever the STEREO/MONO key is depressed.
High level ..... Stereo
Low level..... Monaural</td></tr>
<tr><td>10, 11</td><td>D1 and D2</td><td>Digit Output</td><td>These are digit signal output terminals for LED display. For the two digits display, outputs are as follows:
<table>
<tr><th></th><th>D1</th><th>D2</th></tr>
<tr><td>Upper digit ON</td><td>Low</td><td>High</td></tr>
<tr><td>Lower digit ON</td><td>High</td><td>Low</td></tr>
</table></td></tr>
</table>

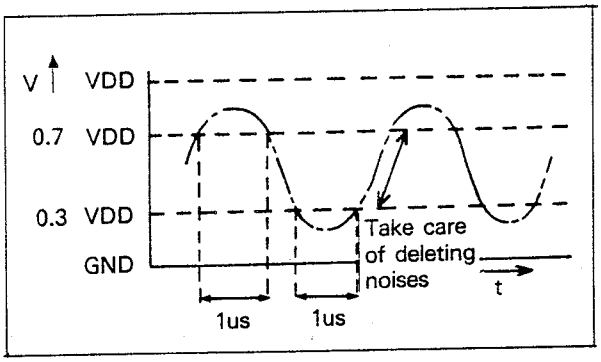
<table>
<tr><th>Pin No.</th><th>Symbol</th><th>Name</th><th>Function Explanation</th></tr>
<tr><td>12</td><td>H. SYNC</td><td>Horizontal Synchronous Signal Input</td><td>This is an input terminal for horizontal synchronous signal. Pulses entered into H. SYNC terminal are counted for approx.
1.02 ms and when the value of the counter is in the range from 14 to 24, existence of synchronizing signal is determined. The input conditions are as follows:
 

Fig. 5-2 Input conditions of horizontal synchronous signals.

Keep the settled levels of low and high states for more than 1 us.
In addition, take care of noises around input threshold voltage.</td></tr>
<tr><td>13</td><td>VT</td><td>Tuning Voltage Control</td><td>This outputs a waveform which is modulated bys the pluse-width in accordance with 14-bit digital information.</td></tr>
<tr><td>14</td><td>MUTE</td><td>Mute Control Output</td><td>This is a sound mute control output terminal. This signal is active high. This terminal is automatically controlled when the device is powered on/off, the program is selected, TV/VIDEO is exchanged, MAIN/SUB is exchanged, STEREO/MONO is exchanged, and during auto-search operation.
Besides, if the cycle disappears during slow digital AFT, "H" is set automatically. (MUTE ON state is set.)
* When the MUTE key is depressed, this port is not changed.</td></tr>
<tr><td>24, 25</td><td>B0 and B1</td><td>Band Control Output</td><td>These are control band signal output terminals for a tuner. Assignment for bands is as follows:
Table 5-2
<table>
<tr><th>B0</th><th>B1</th><th>Band</th></tr>
<tr><td>L</td><td>L</td><td>VHF-L</td></tr>
<tr><td>H</td><td>L</td><td>VHF-H</td></tr>
<tr><td>H</td><td>H</td><td>CATV</td></tr>
<tr><td>L</td><td>H</td><td>UHF</td></tr>
</table></td></tr>
<tr><td>26</td><td>M/S</td><td>MAIN/SUB Exchange Output</td><td>This is an exchange signal output terminal of MAIN/SUB. This signal goes high when the device id powered on. This terminal is controlled by the MAIN/SUB key. Whenever the key is depressed, the signal rolls over between low and high.

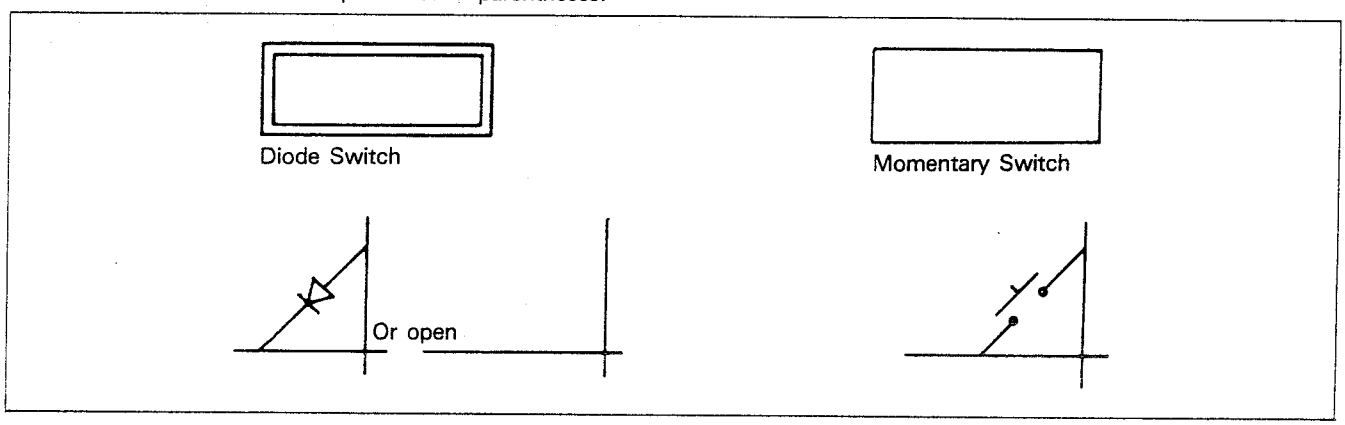
High level ..... Main
Low level..... Sub</td></tr>
</table>

Pin No.	Symbol	Name	Function Explanation
27	POW	Power Control Output	This is a power control terminal, which serves to control an external relay. This output is active high and when the reset function is operated, it reads POWER ON START key at approx. 20 ms after releasing reset. If POWER ON START key is ON, the power immediately turns ON, and if the key is OFF, the power is off until POWER ON/OFF key input. This output state rolls over between high and low whenever the POWER ON/OFF key is depressed. High level ..... Power ON Low level..... Power OFF In addition, if the off-timer is set, when the timer setting time elapses, the signal automatically goes low.
29, 30	BRT and COL	Brightness Control Output and Color Control	These are brightness and color control terminals. These output a waveform modulated bys the pulse width with 64 levels in accordance with 6-bit latch data (active low). When it is powered on, values before the device is powered off are read out from the EAROM and output to each port.
28	VOL	Sound Volume Control Output	This is sound volume control terminal (active low). The MUTE flag provided in the M50431-101SP allows the signal to immediately go high. For other specifications and output waveform, see the section of "BRT and COL".
30 ~ 33	C0 ~ C2	C1 ~ C3 Output of M58655P and key scan output	These are terminals for mode control of EAROM M58655P and key return signal source output terminals for key matrix.
34	C3	Clock Output for M58655P and M50453-012P and key scan output	This is a clock output terminal for an EAROM M58655P and on-screen display IC M50453-012P. Connect this terminal to the CLK of the M58655P and CLK of the M50453-012P and key return signal source output terminals for key matrix.
35	RC	Remote Control Signal Input	This is a remote control signal input terminal. A remote control signal is acknowledged by sensing its edge. When a signal applied at the RC terminal goes high, the remote control signal reception operation is executed. The remote control signal input decision circuit includes a noise reduction circuit, which serves to delete less than 64 us pulses as noises. It can prevent malfunction of the device due to noises.
36	RESET	Reset Input	By adding the circuit as shown in Fig. 5-5 to the RESET terminal, when the device is powered on, the reset function can be activated. In addition, a Schmitt circuit is provided at the RESET terminal. although the reset is released at the time RESET terminal voltage Vc exceeds the threshold voltage VTH1, once released, unless Vc drops at the threshold voltage lower than VTH2, the reset function cannot be activated again. In addition, to securely activate the power-on reset function, it is necesary to set the time Vc is larger than VTH1 is more than 1 ms after the power supply voltage VDD becomes more than 4.5V Figure 5-6 shows.
37	D	Data Input/Output of M58655P and M50543-012P	This is an input/output terminal for EAROM M58655P or output terminal for on-screen display IC M50453-012P. Connects this terminal to the I/O of the M58655P and to the Ao of the M50453-012P.
38 ~ 41	E0 ~ E3	Key Return Input	This is a key return signal input for the key matrix.
42	VDD	Power Supply Terminal	Connect this terminal to the 5V power supply.

(3) Structure of Key Matrix

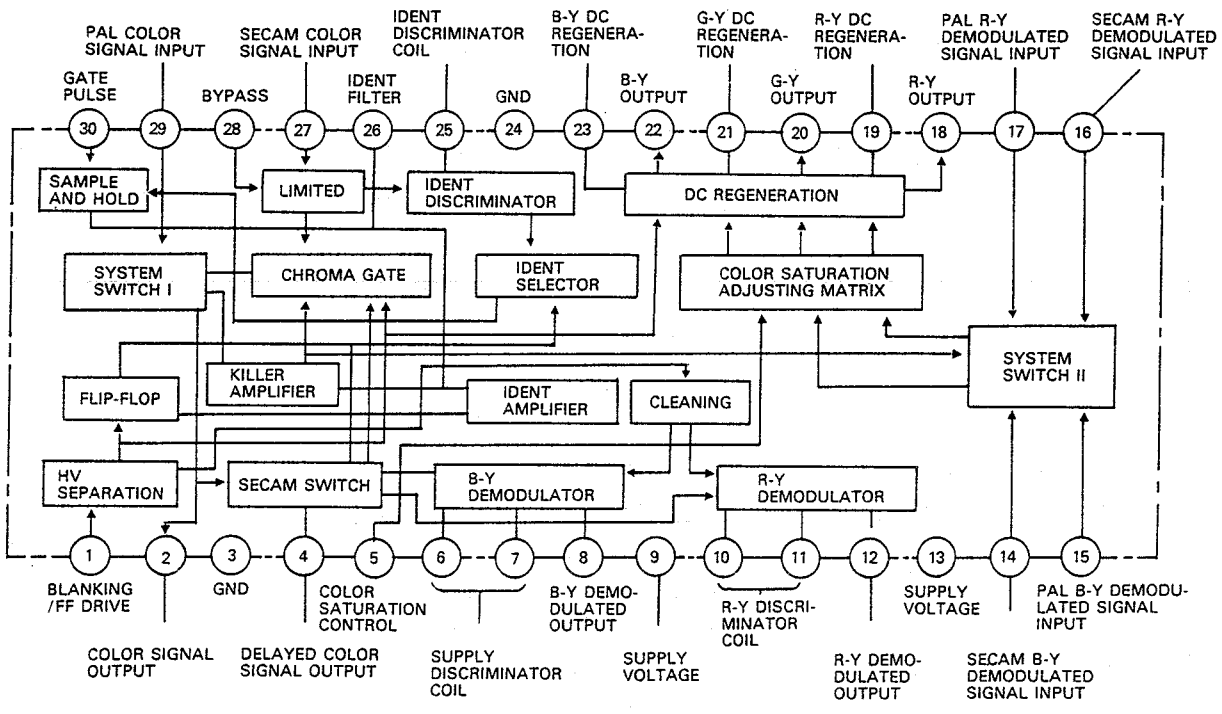
Output \ Input	$\overline{E0}$ (38)	$\overline{E1}$ (39)	$\overline{E2}$ (40)	$\overline{E3}$ (41)
$\overline{Sa}$ (21)	PR (+)	VOL (+)	BRT (+)	COL (+)
$\overline{Sb}$ (20)	PR (−)	VOL (−)	BRT (−)	COL (−)
$\overline{Sc}$ (19)	POWER ON/OFF	TV/VIDEO	MAIN/SUB	STEREO/MONO
$\overline{Sd}$ (18)	FT (+)	FT (−)	MUTE	PR CALL
$\overline{Se}$ (17)	AS (+)	AS (−)	AFT ON	
$\overline{Sf}$ (16)	30 PR	12 PR	8 PR	
$\overline{Sg}$ (15)	1 BAND	4 BANDS	1 VIDEO/2 VIDEO	POWER ON START
$\overline{C0}$ (31)	PR 1	PR 2	PR 3	PR 4
$\overline{C1}$ (32)	PR 5	PR 6	PR 7	PR 8
$\overline{C2}$ (33)	PR 9	PR 10/PR 0	PR 11/PR 1*	PR 12/PR 2*
$\overline{C3}$ (34)	PR 13	PR 14	PR 15	PR 16

( ) Terminal numbers are represented in parentheses.



4. M51397 AP

BLOCK DIAGRAM



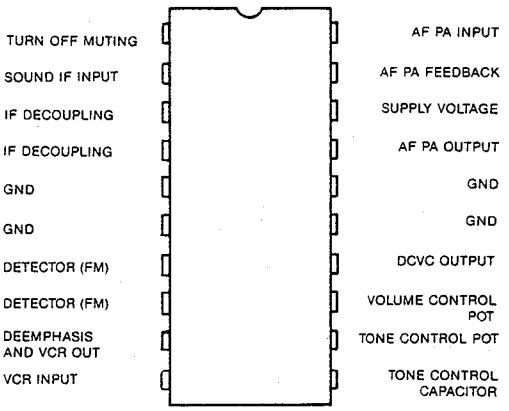
5. TDA8190

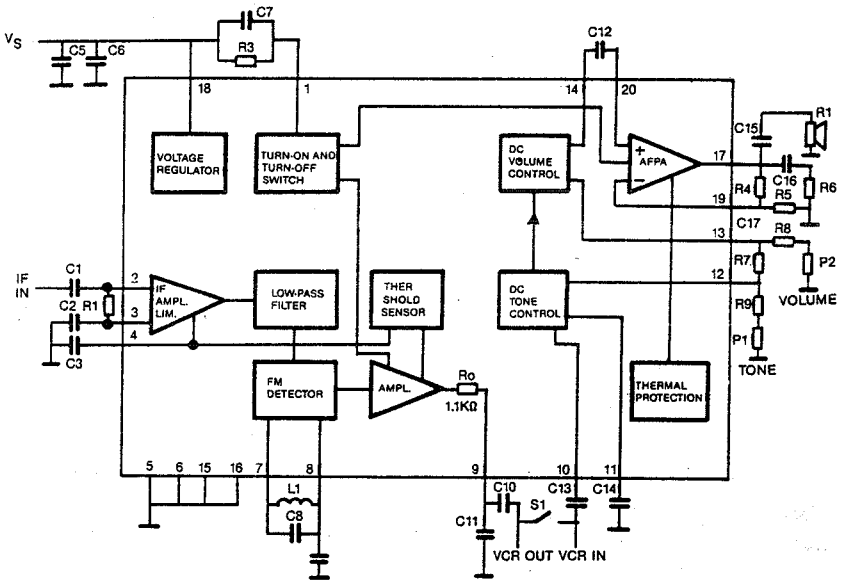
(1) Function of the TDA8190

The TDA8190 is TV sound channel with DC tone and volume controls plus seperate VCR input and output connections in a 20 leads dual-in-line package.

The device delivers an output power of 1.5 watts into 8 Ohm (THD = 10%, Vs = 12V). Included int he TDA8190 are: IF amplifire limiter, active low-pass filter, AF preamplifier and power amplifier, turn off muting, mute circuit and thermal protection.

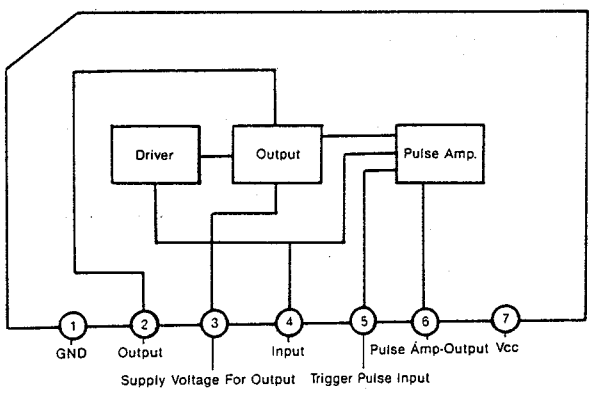
BLOCK DIAGRM





6. AN5515.

(1) Block Diagram



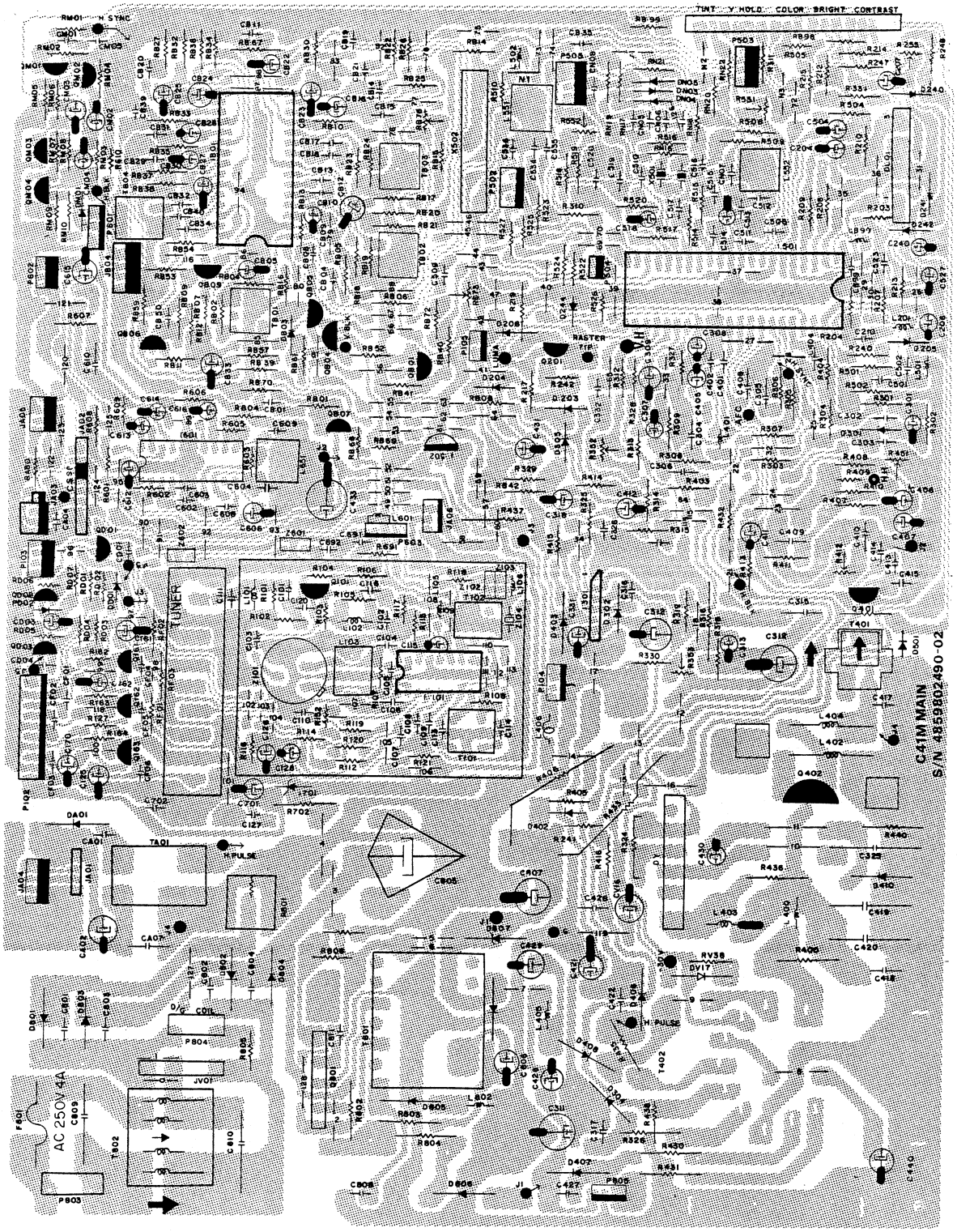
7. IC VOLTAGE CHART

NOTE: VOLTAGE MEASURED UNDER STANDARD COLOR BAR SINGAL INPUT.

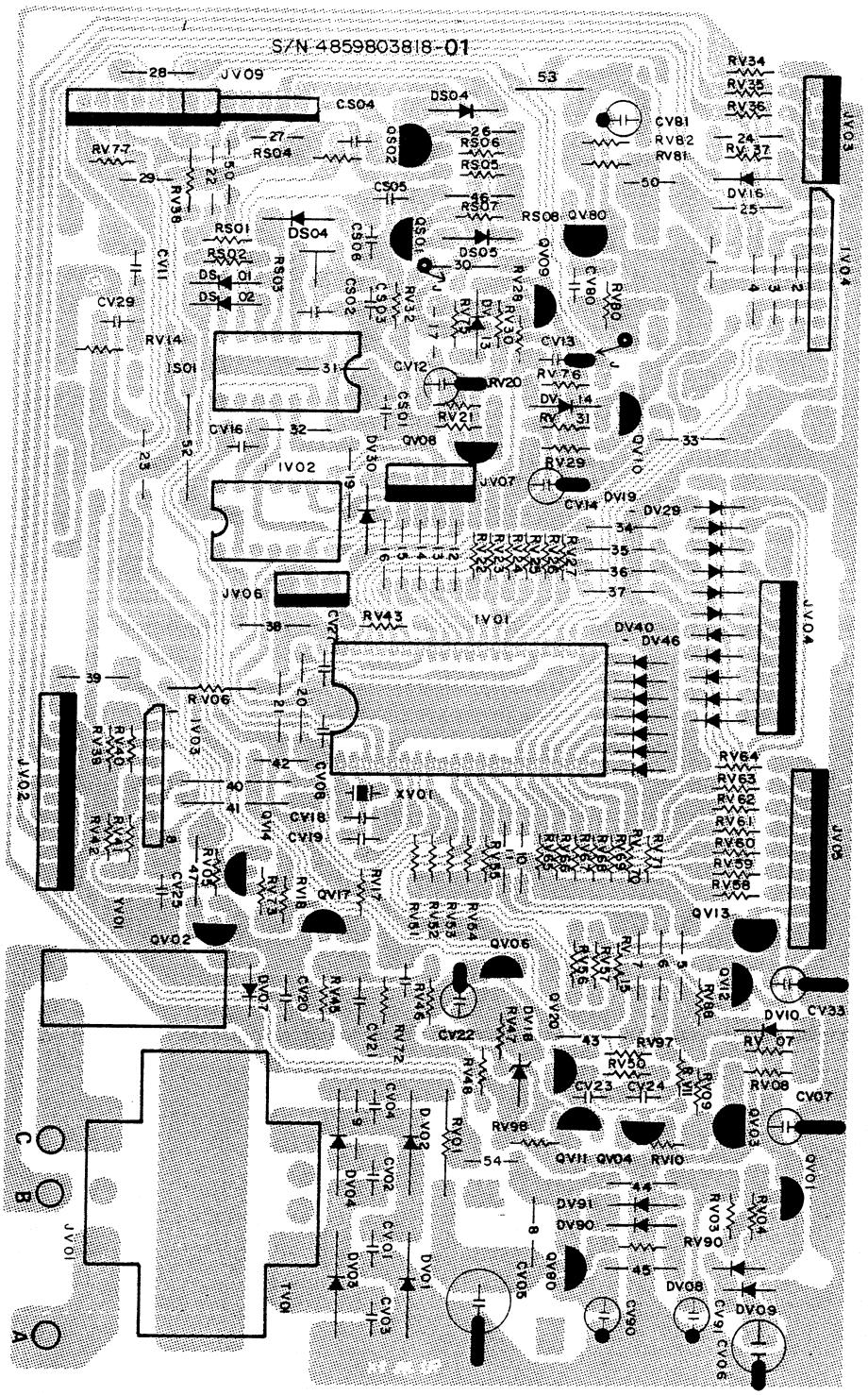
LOCATION	IC TYPE	VOLTAGE (PIN NO.)										
I101	TA7606AP	1	2	3	4	5	6	7	8	9	10	11
		4.6	4.6	6.4	3.9	2.2	5.2	3.2	7.9	3.2	3.2	11.5
		12	13	14	15	16						
		3.6	0	7.3	4.6	4.6						
I501	TA7698AP	1	2	3	4	5	6	7	8	9	10	11
		4.2	11.3	4.25	4.2	1	9.0	5.0	9.3	5.7	7.1	0
		12	13	14	15	16	17	18	19	20	21	22
		8.6	9.0	3.3	3.3	7.8	3.8	8.0	3.9	7.6	6.9	
		23	24	25	26	27	28	29	30	31	32	33
		6.3	0.5	3.74	7.9	0.44	2.6	—	0	0.4	0.4	8.5
IV01	M50431 —XXXSP	34	35	36	37	38	39	40	41	42		
		4.8	4.9	3.3	—	—	2.8	—	6.8	7.1		
		1	2	3	4	5	6	7	8	9	10	11
		2.1	2.1	4.8	4.8	0	0	0	4.8	0	4.8	3.0
		12	13	14	15	16	17	18	19	20	21	22
		4.0	3.2	0	3.0	2.7	1.5	—	—	—	—	0
		23	24	25	26	27	28	29	30	31	32	33
		0	—	—	—	4.6	4.9	11.5	11.5	—	—	—
		34	35	36	37	38	39	40	41	42		
		—	4.7	5.3	—	2.9	4.8	4.8	3.2	4.8		
IB01	M51397AP	1	2	3	4	5	6	7	8	9	10	11
		2.3	5.3	0	—	5.4	4.6	2.3	7.6	11	4.6	2.3
		12	13	14	15	16	17	18	19	20	21	22
		7.6	11.2	2.6	2.6	2.6	2.6	6.7	3.4	6.7	3.5	0
		23	24	25	26	27	28	29	30			
		3.5	0	2.7	7.1	5.3	5.3	4.6	—			
I301	AN5515	1	2	3	4	5	6	7				
		0	—	25	6	0	3	25				
I601	TDA8190	1	2	3	4	5	6	7	8	9	10	11
		4.7	3.4	3.6	3.4	0	0	3.45	—	4.0	4.5	7.4
		12	13	14	15	16	17	18	19	20		
		6.0	5.4	4.3	0	0	0.8	—	—	—		

PRINTED CIRCUIT BOARDS

COMPONENT VIEW OF MAIN BOARD

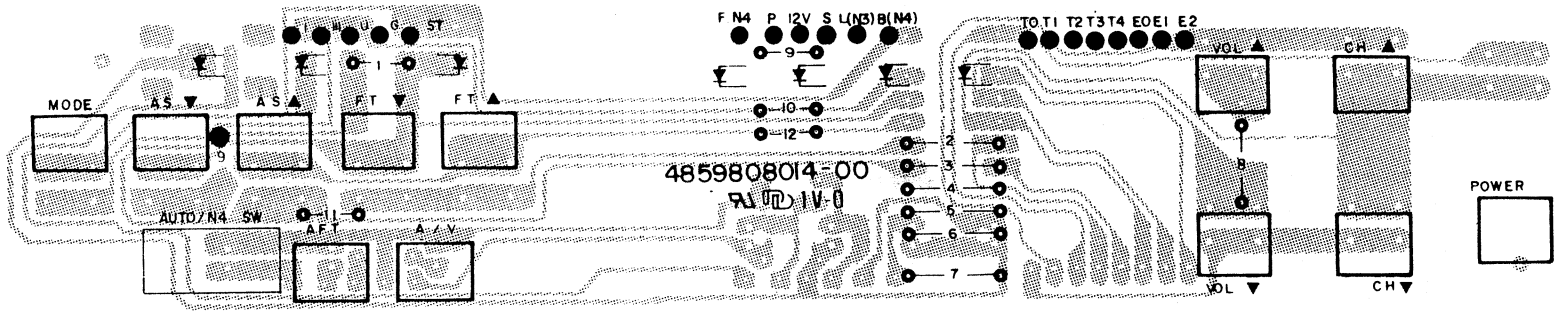


COMPONENT VIEW OF RECEIVER BOARD

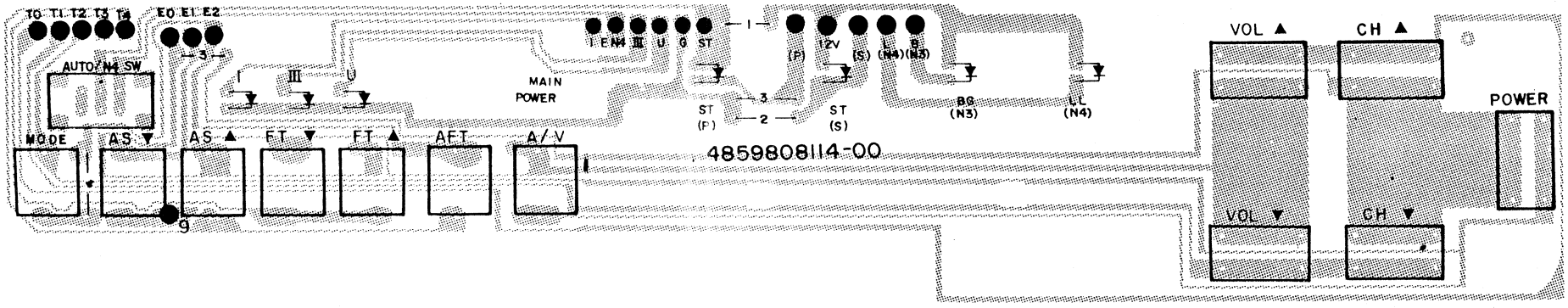


COMPONENT VIEW OF CONTROL BOARD

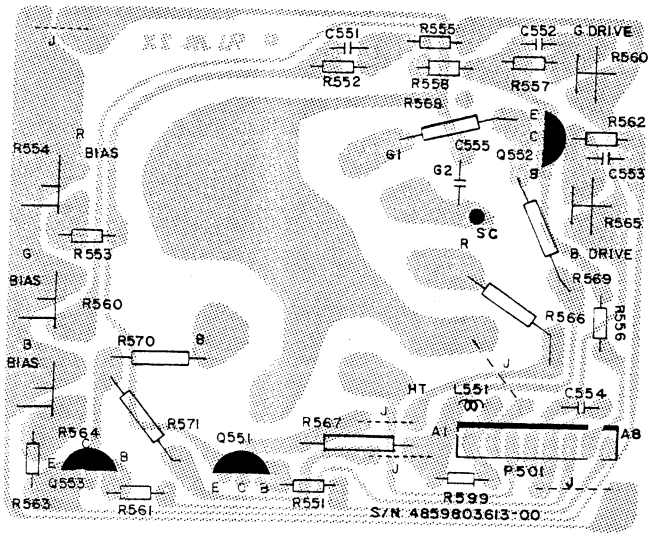
1) 14 INCH



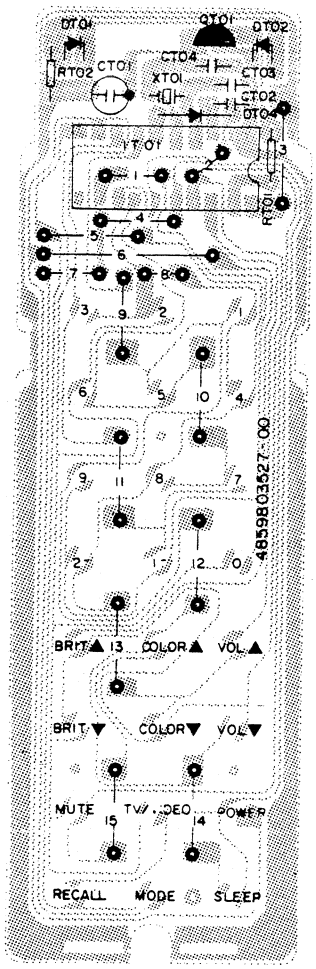
2) 20 INCH



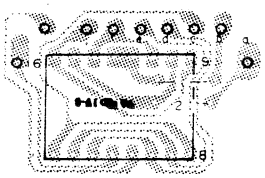
COMPONENT VIEW OF CRT BOARD



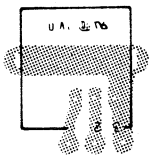
COMPONENT VIEW OF TRANSMITTER BOARD



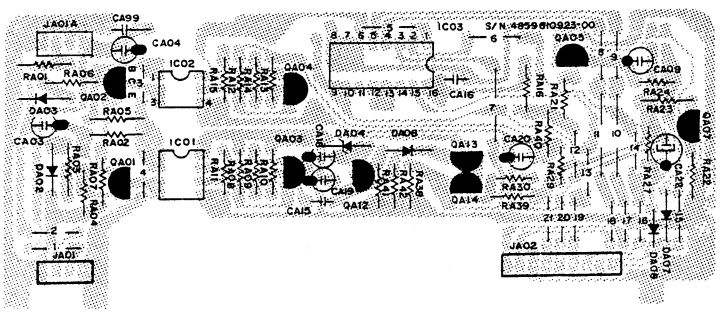
COMPONENT VIEW OF CH DISPLAY BOARD



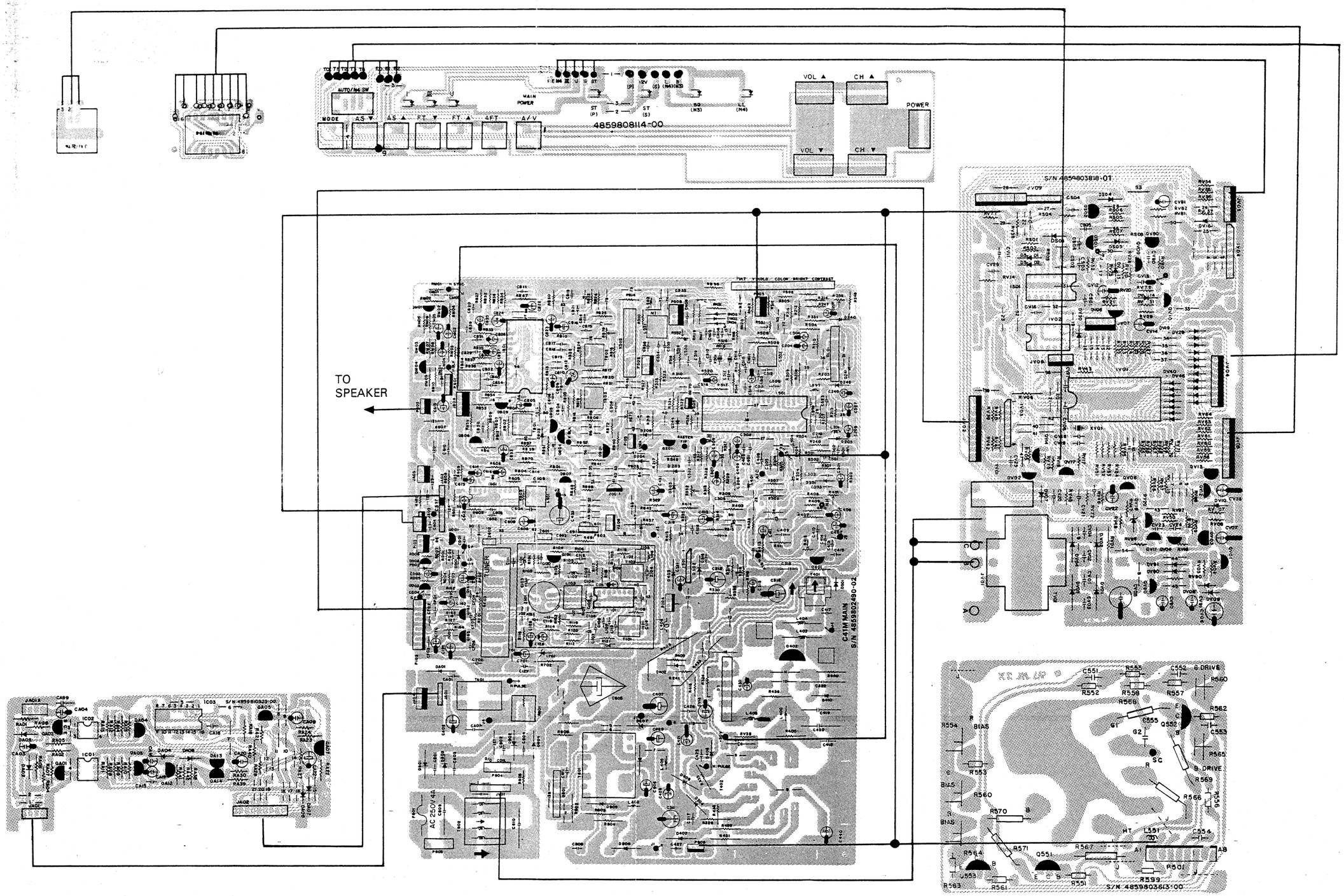
COMPONENT VIEW OF PRE-AMP BOARD



COMPONENT VIEW OF A/V BOARD

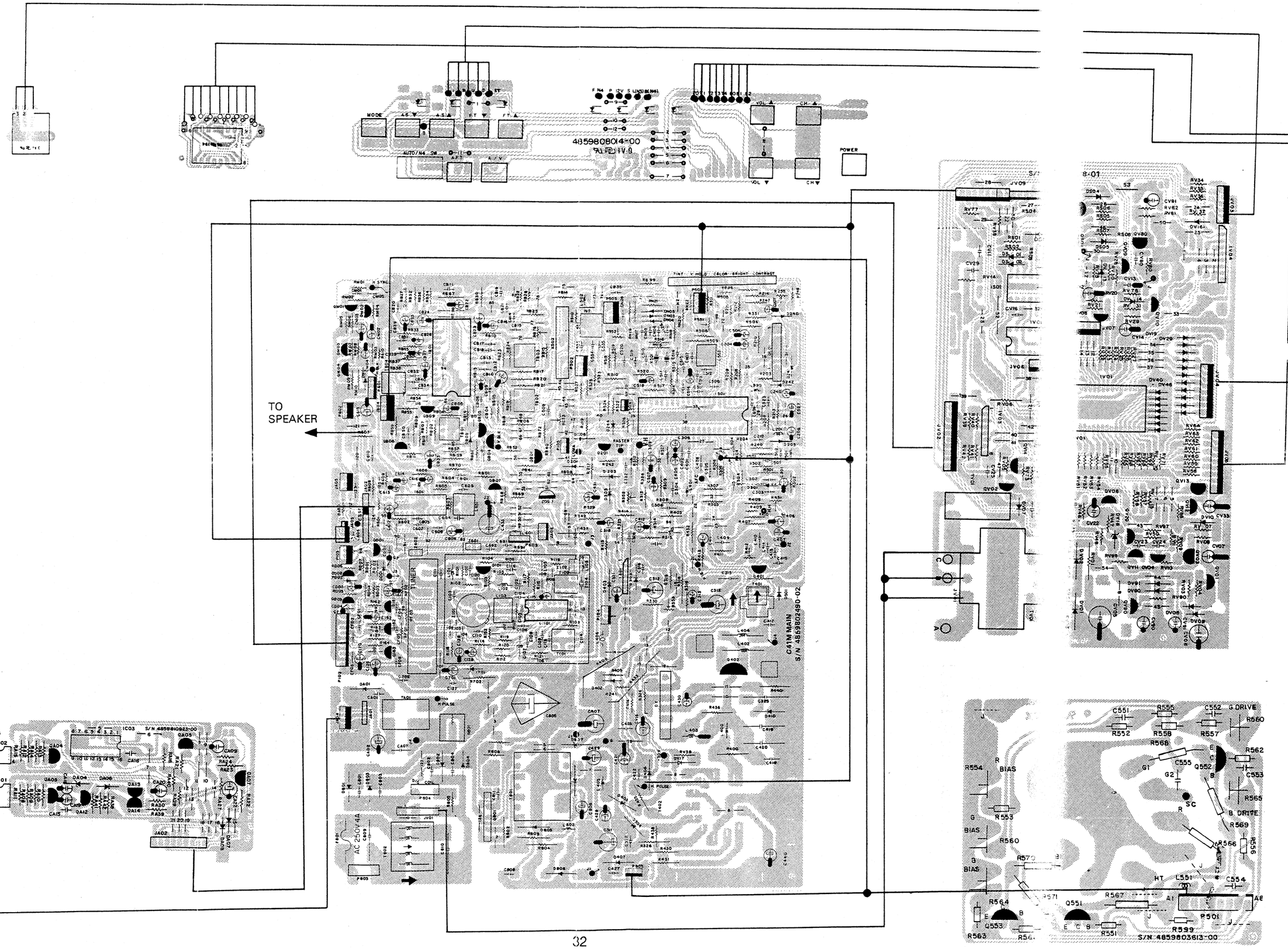


• 20 INCH


AUTO/M4.SW
MODE
MAIN POWER
4859808114-00
VOL ▲
CH ▲
POWER
VOL ▼
CH ▼
TO SPEAKER
TUNER
C411M MAIN
S/N 4859802490-01
AC 250V 4A
S/N 4859803818-01
S/N 4859803613-00
R555
C552
R560
C551
R552
R558
R557
R562
R568
C555
Q552
C553
G1
G2
SC
R565
R553
B DRIVE
R569
R560
R566
R570
R564
R571
Q551
R567
R501
R563
R561
R599

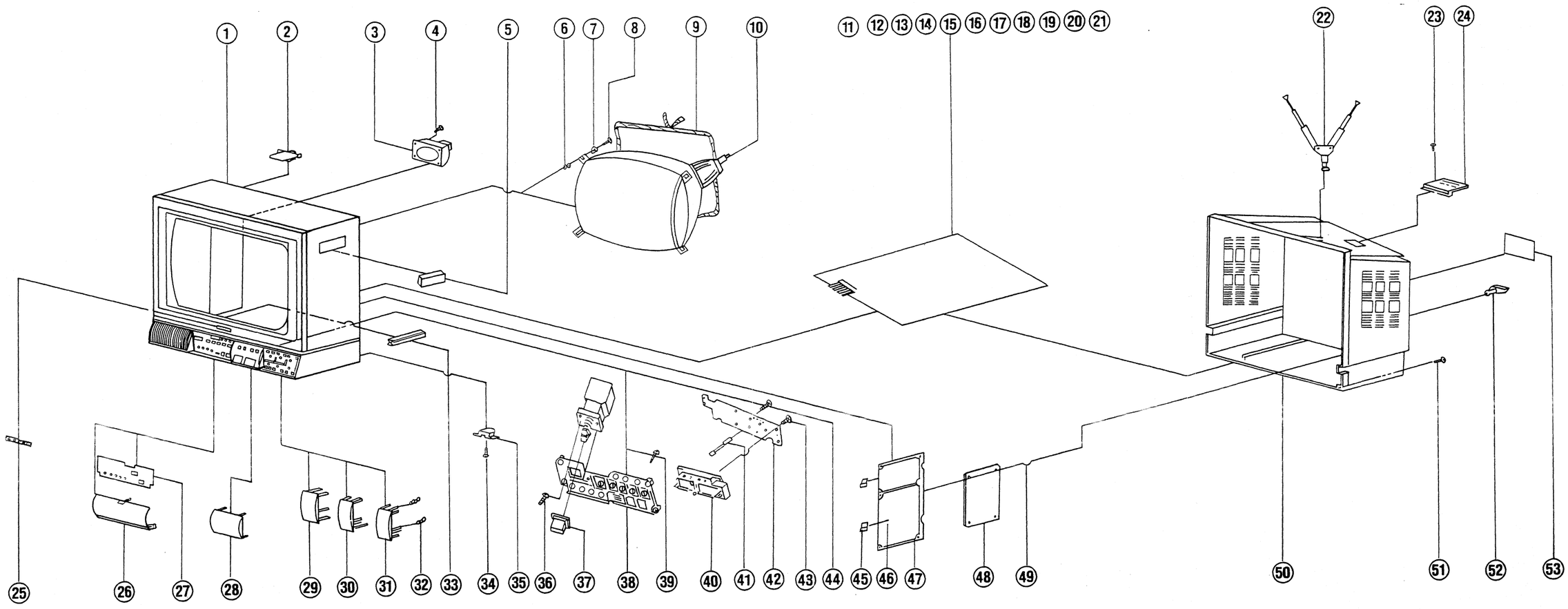
WIRING CONNECTION DIAGRAM

1) 14 INCH



EXPLODED VIEW

1) 14 INCH

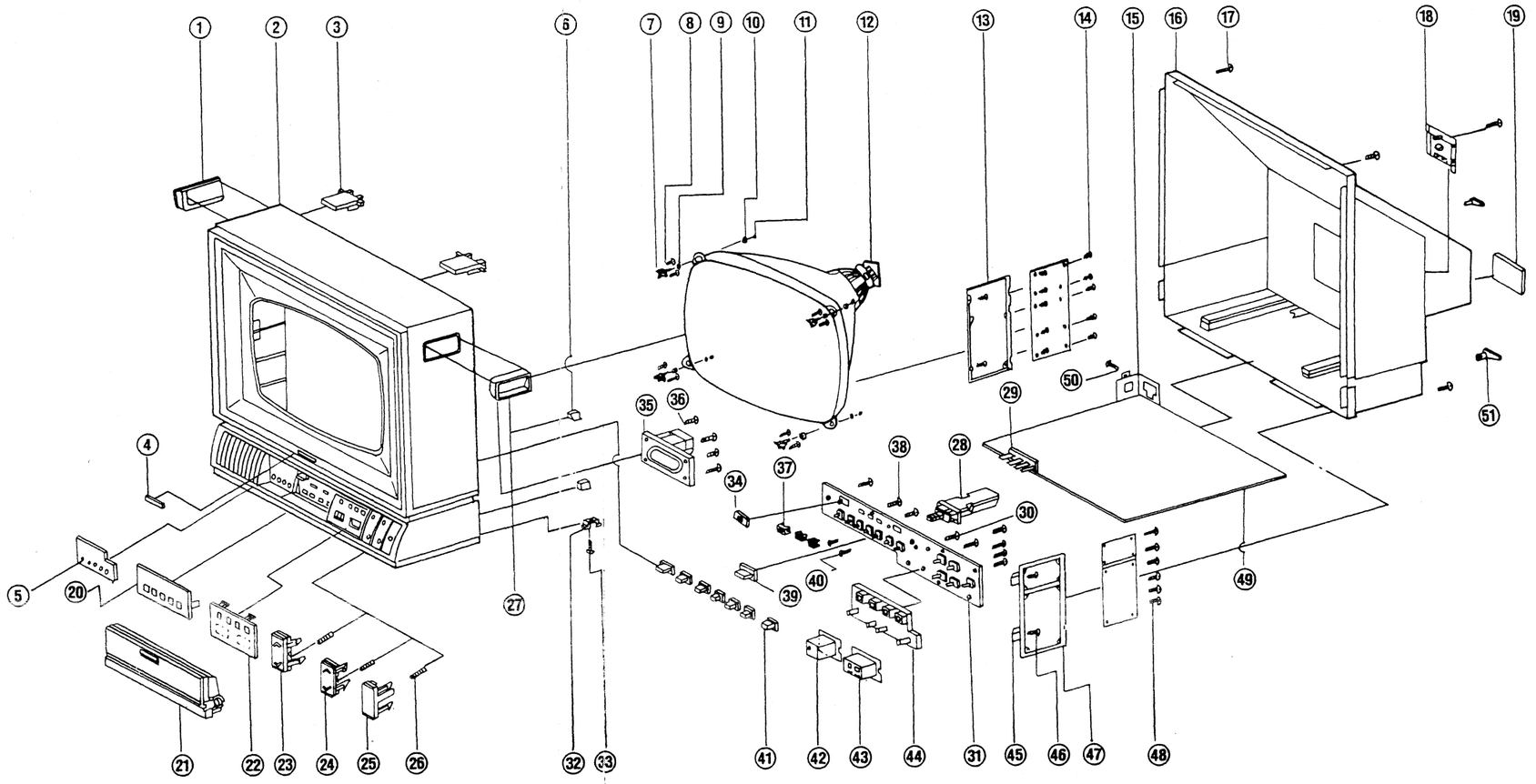


1	4352031000	MFZN FRONT	1	FR HIPS	
2	4353311301	RETBINER BACK	2	FR HIPS	
3		SPEAKSR	1		
4	7121301211	SCREW TAPPING	4	T2S DRN 3×12 MFZN	①+③
5	4850715600	SPRING	6	SPRING	
6	4856210100	WASHER RUBBER	4	RUEPER BK,	
7	4856213200	WASHER CRT FIX	4	CR-5 BK T1 2	
8	7122502011	SCREW TAPPING	4	T2S TRS 5×20 MFZN	⑦+⑩
9		COIL DEGAUSSING	1		
10		CRT			
11	7121301311	SCREW TAPPING	2	T2S PRN 3×10 MFZN	⑬+MAIN PCB
12	7121301011	SCREW TAPPING	1	T20 PRN 3×10 MFZN	⑪+TR
13	4857021700	HERT C SINK	1	F1050P-H24 T20	
14	7121301011	SCREW TAPPING	2	T2S PAN 3×10 MFZN	⑩+MAIN PCB
15	7121301011	SCREW TAPPING	2	T2S PAN 3×10 MFZN	⑬+TR
16	4857021600	HEAT B SINK	1	A1050P-H24 T20	
17	7121301315	SCREW TAPPING	2	T20 PRN 3×13 MFZN	⑪+MAIN PCB
18	7121301011	SCREW TAPPING	1	T20 PRN 3×10 HFZN	⑬+TR

19	4857021500	HEAT A SINK	1	A1050P-H24 T20	
20	71212401211	SCREW TAPPING	1	T2S TRS 4×12 MFZN	㉕+MAIN PCB
21	4853731800	RETA MFIN FBT	1	SBHG 1-A T10	
22		ROD ANTENNA	1		
23	7121401211	SCREW TAPPING	1	T2S PAN 4×12 MFZN	㉔+㊵
24	4853616610	TERMINAL ANT	1	FT HIPS BK	
25	4855613601	MAPR BRFND	1	A1050P-H24 T1.4	
26	4852804801	DOOR	1	A1050P-H24 T1.4	
27	4855040300	DECO VR	1	A1050P-H24 T0.4	
28	4855109801	DECO CH GLHSS	1	P.C RED	
29	4854826003	BUTTON POWER	1	ABS BK (VOLUME)	
30	4854826002	BUTTON POWER	1	ABS BK (CHANNEL)	
31	4854826001	BUTTON POWER	1	ABS BK (POWER)	
32	4856715600	HANLES CAEINET	2	FR HIPS BK	
33	4853730300	RETA MFZN PCB	1	FR HIPS BK	
34	7121301011	SCREW TAPPING	1	T2S PAN 3×10 MFZN	①+㉟
35	4853510301	STOPPER CORD	1	FR ABS BK	
36	2121301011	SCREW TAPPING	2	T2S PAN 3×10 MFZN	

37	4854811302	BUTTON PUSH AUTO	1	ABS BK	
38	4854821101	BUTTON TOUCH VR	1	ABS BK	
39	7121401211	SCREW TAPPING	2	T2S PAN 4×12 MFZN	①+㊳
40	4853730201	LETA LED	1	HIPS BK	
41	9792309600	HOLAER LAHP-L	3		
42		CONTROL PCB	1		
43	7121301011	SCREW TAPPING	2	T2S PAN 3×10 MFZN	㊵+㊵
44	7121401211	SCREW TAPPING	5	T2S PAN 4×12 MFZN	①+㊳
45	4853730400	RETA SUB PCB	2	HIPS BK	
46	7122401411	SCREW TAPPING	2	T2S TPS 4×14 MFZN	㊵+㊵
47	4853926301	FRAME CHASSIS	1	FR HIPS BK	
48		SUB PCB			
49	7128300801	SCREW TAPPING	4	T2S WAS 3×8 MFZN	㊵+㊵
50	4852120800	COVER BACK	1	AIPS BK	
51	7122401411	SCREW TAPPING	4	T2S TRS 4×14 MFZN	①+
52	4853513902	TIE CORD		HIPS BK	
53	48554129	SPEC PLATE	1	A1050P-H24 T0.4	

2) 20 INCH



1	4852612501	HANDLE CAB A	1	HIPS BK	
2	4852031301	MASK FRONT	1	HIPS BK	
3	4853311300	RETAINER BACK	2	HIPS BK	
4	4855615900	MASK BRAND	1	A1050P-H24 T0.4	
5	4855039503	DECD VR A	1	A1050P-H24 T0.4	
6	4853720100	RETA CHAS	4	HIPS NO	
7	4851511600	BRACKET CRT AS	4	BRACKET+SCREW	
8	7122401411	SOREW TAPPING	12	T2S TRS 4×14 MFZN	
9	4856213500	WASHER RUBBER	4	TMR-CA/NF-0.1 t2.0	
10	4856213200	WASHER CRT FIX	4	SK-5 tx2 MEZN	
11	7391600011	NUT HEX	4	INUT 6 MFZN	
12	4859601661	CRT	1	510RJB22-TC09	
13	485394200	FRAME CHAS	1	ABS BK	
14	7128300811	SCREW TAPPING	6	T2S WAS 3×8 MFZN	
15	4853722200	RETA F.B.T	1	SPCC t10 SN-2	
16	4852120901	BACK COVER	1	HIPS BK	
17	7122401411	SCREW TAPPING	4	T2S T×S 4×14 MFZN	

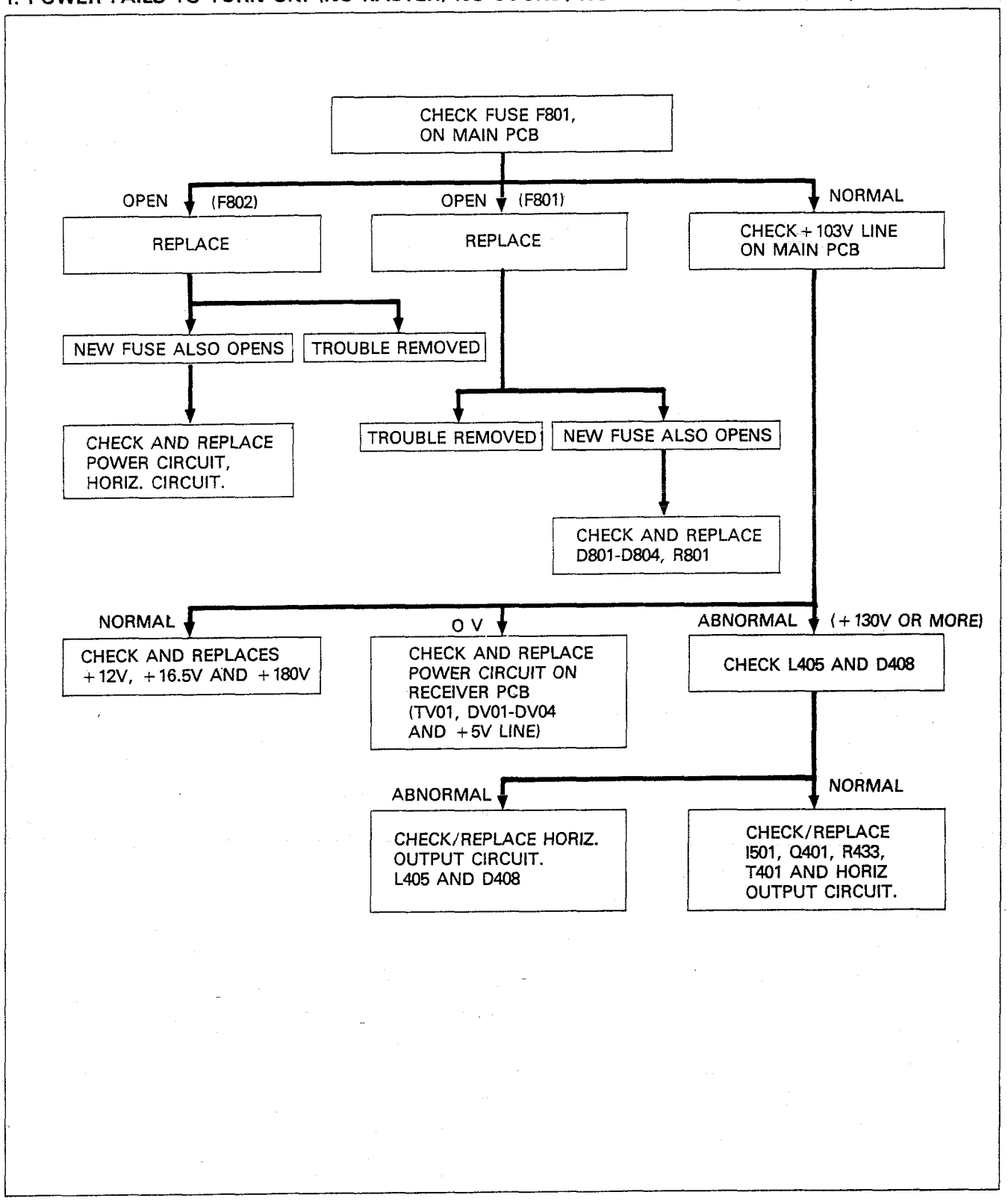
18	4853618601	TERM ANT AS	1	HIPS BK	
19	48554129	PLATE REMARK	1	A1050P-H24 T0.4	
20	48550401	OECO VR B			
21	4852804900	DCOR	1	ABS BK	
22	4855109930	DECO CH GLASS	1	DARK RED	
23	4854826201	BUTTON PUSH	1	ABS BK	
24	4854826202	BUTTON PUSH	1	ABS BK	
25	4854826203	BUTTON PUSH	1	ABS BK	
26	4856716000	SPRING	3	SWPA	
27	4852612500	HANDLE CAB A	1	FR ABS BK	
28		POWER SW	1		
29			1		
30	7121301011	SCREW JAPPING	2	T2S PAN 3×10 MFZN	
31		CONTROL PCB	1		
32	4853510300	STOPPER CORD	1	HIPS BK	
33	7121300811	SCREW TAPPING	1	T2S PAN. 3×8 MFZN	
34	4857613600	PLATE SL INSU A	1	PVC BK T0.8	

35		SPEAKER	1		
36	7123300811	SCREW TAPPING	4	T2S WAS 3×8 NFZN	
37	4853513300	HOLOER LED	3	ABS NATURAL	
38	7121301011	SCREW TAPPING	7	T2S PAN 3×10 MFZN	
39	4854811300	BUTTON PUSH AUTO	1	ABS	
40	7121300811	SCREW TAPPING	2	T2S PAN 3×8 MFZN	
41	4854811600	BUTTON PUSH	6	ABS BROWN	
42		PREAMP	1		
43		PCB CH LED	1		
44	4853519900	HOLDER LAMP	1	ABS BK	
45	4853720100	RETA CHAS	2	HIPS NO	
46	7122461411	SCREW TAPPING	2	T2S TRS 4×11 MFZN	
47	4853926300	FRAME CHASSIS	1	ABS BK	
48	7128300811	SCREW TAPPING	6	T2S WAS 3×8 MFZN	
49	4859800990	PCB MAIN	1	T1.6×300×230	
50	7121300811	SCREW TAPPING	1	T2SPAN 3×8 MFZN	
51	4853513902	TIE CORD	2	HIPS BK	

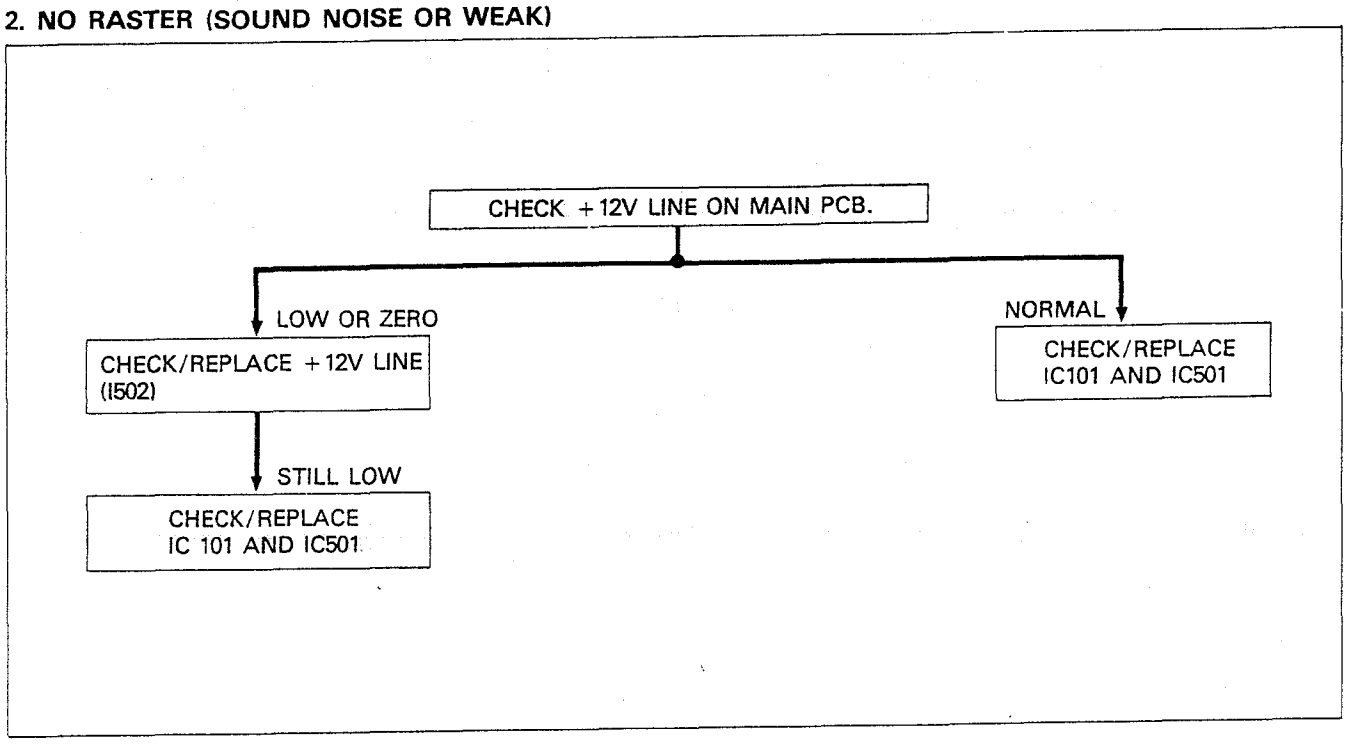
TROUBLESHOOTING CHARTS

The following charts are devoted to troubleshooting which, if followed carefully, will assist you in tracking down a fault to the correct stage.
In order to utilize the charts (fault trees), firstly establish the complaint, *i.e.—No Raster, No Sound.*
Locate the chart applicable and then progress through the various alternatives until a final block indicates the offending components or stage.

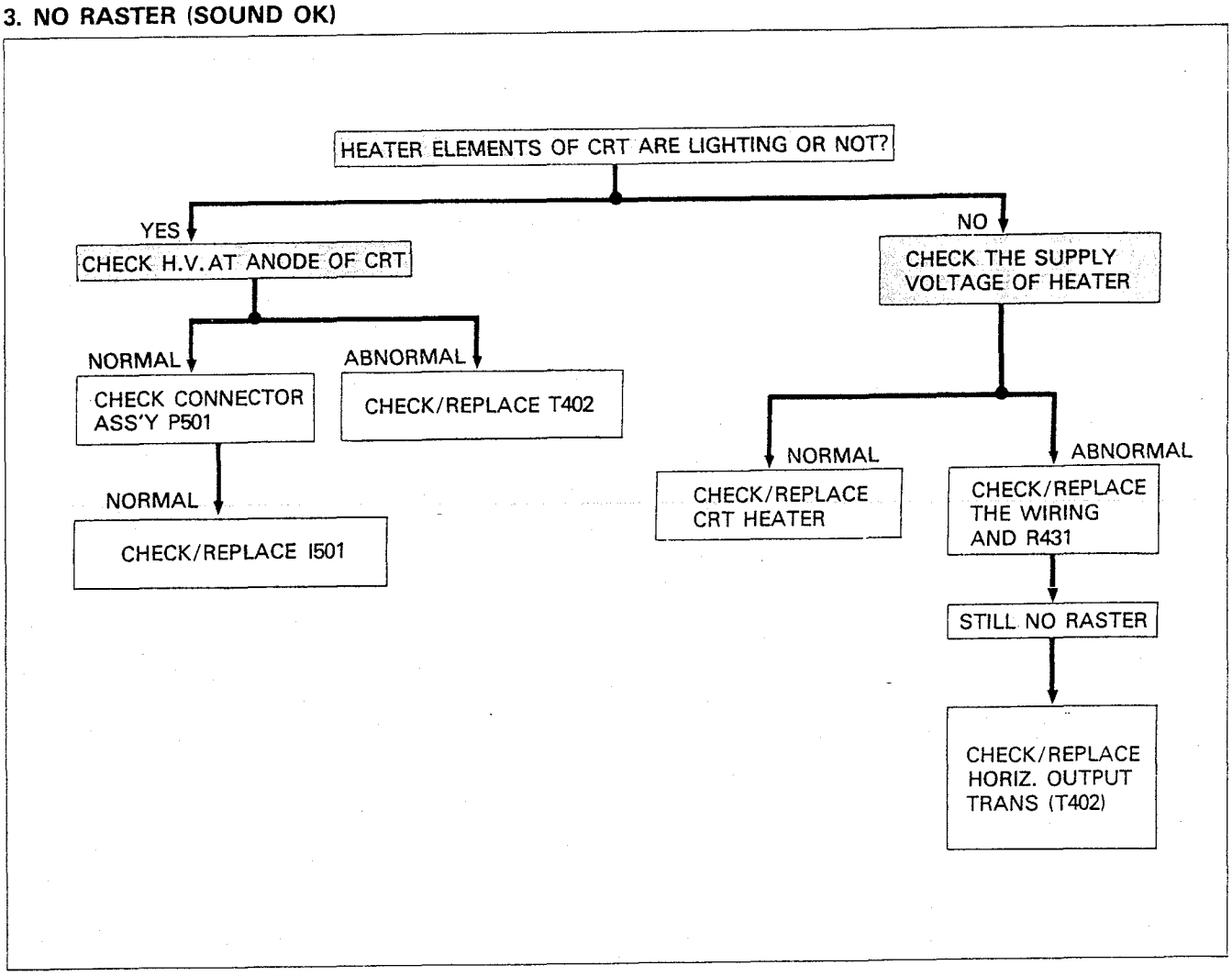
1. POWER FAILS TO TURN ON. (NO RASTER, NO SOUND, NO ATTEMPT TO TURN ON)


CHECK FUSE F801, ON MAIN PCB
OPEN (F802)
OPEN (F801)
NORMAL
REPLACE
REPLACE
CHECK + 103V LINE ON MAIN PCB
NEW FUSE ALSO OPENS
TROUBLE REMOVED
CHECK AND REPLACE POWER CIRCUIT, HORIZ. CIRCUIT.
TROUBLE REMOVED
NEW FUSE ALSO OPENS
CHECK AND REPLACE D801-D804, R801
NORMAL
0 V
ABNORMAL (+ 130V OR MORE)
CHECK AND REPLACES +12V, +16.5V AND +180V
CHECK AND REPLACE POWER CIRCUIT ON RECEIVER PCB (TV01, DV01-DV04 AND +5V LINE)
CHECK L405 AND D408
ABNORMAL
NORMAL
CHECK/REPLACE HORIZ. OUTPUT CIRCUIT. L405 AND D408
CHECK/REPLACE I501, Q401, R433, T401 AND HORIZ OUTPUT CIRCUIT.

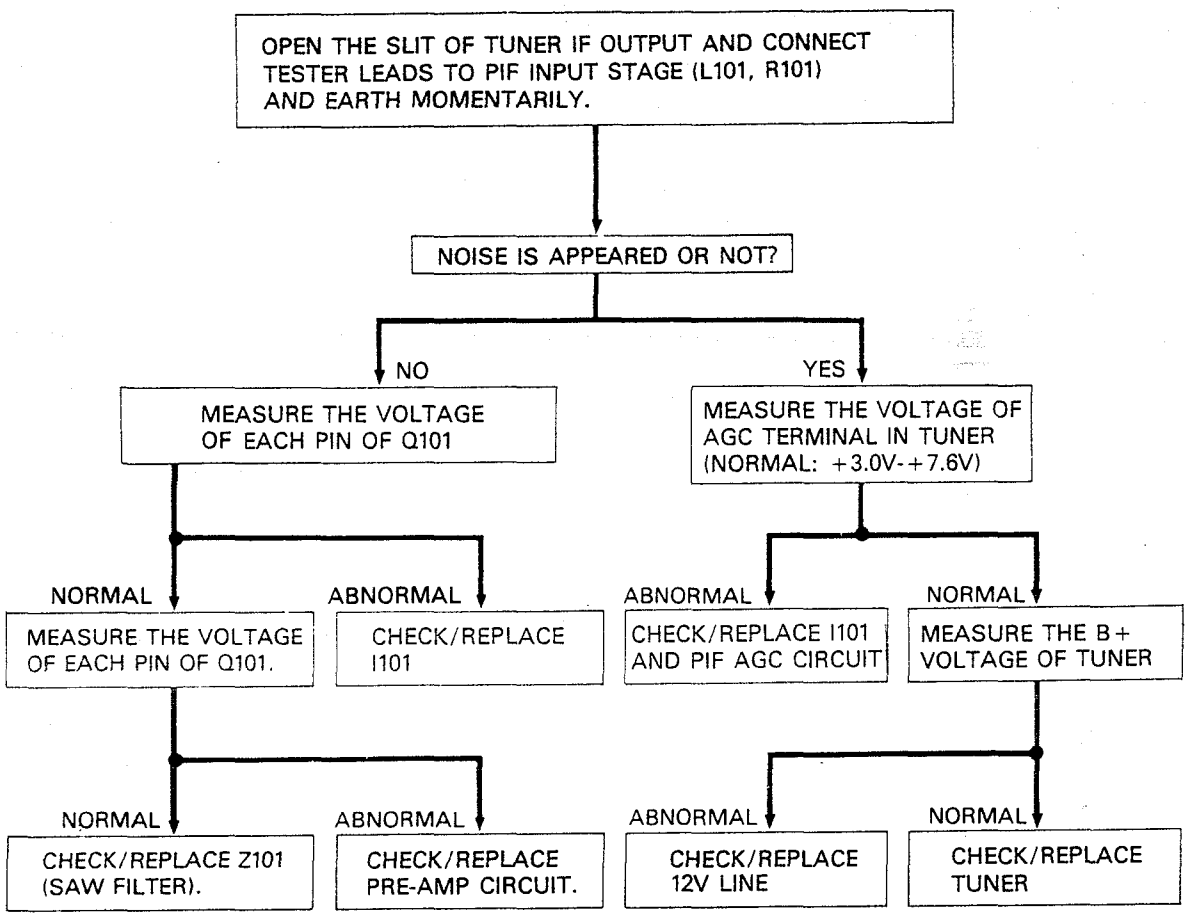
2. NO RASTER (SOUND NOISE OR WEAK)



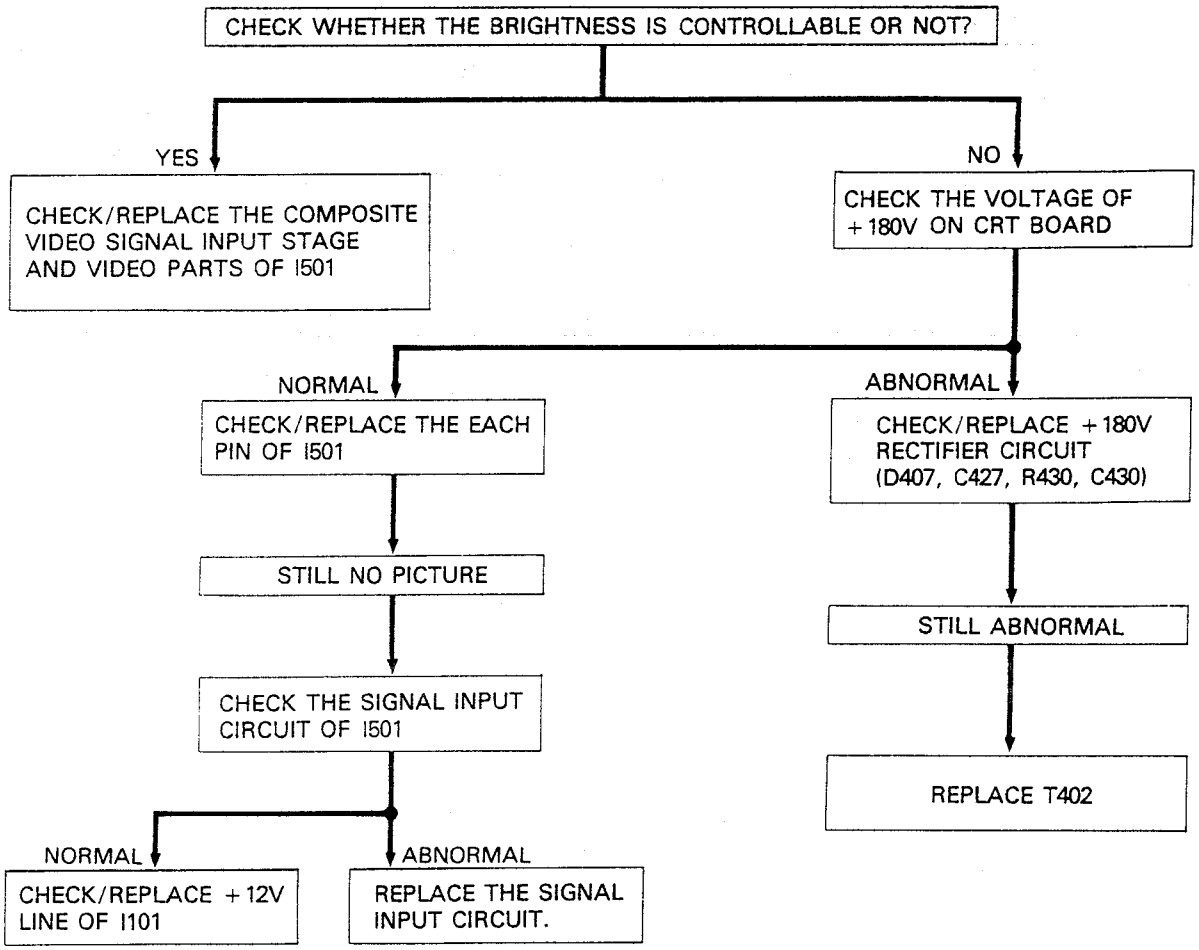
3. NO RASTER (SOUND OK)



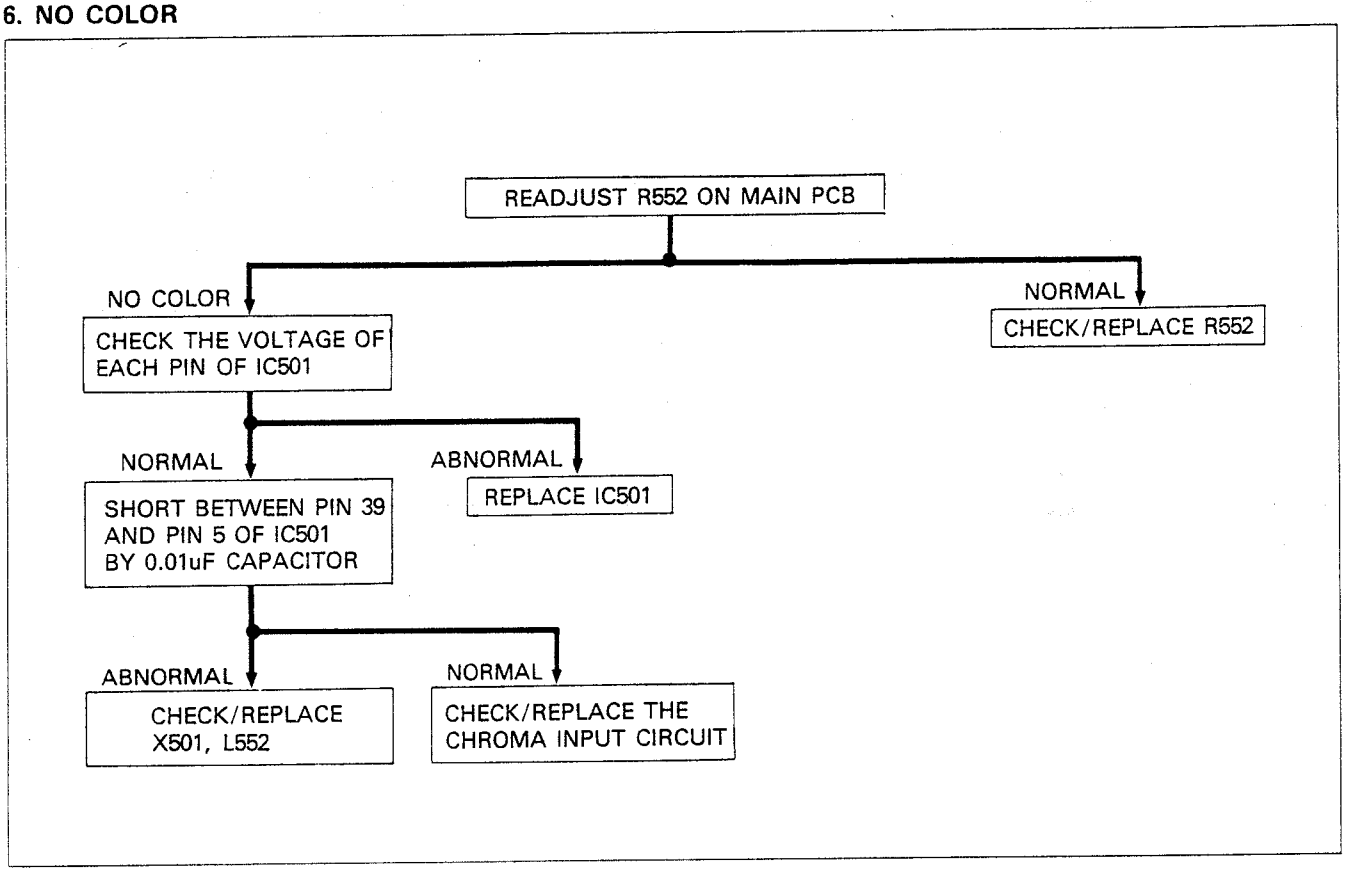
4. NO PITCTUR (RASTER REMAIN) AND NO SOUND


OPEN THE SLIT OF TUNER IF OUTPUT AND CONNECT TESTER LEADS TO PIF INPUT STAGE (L101, R101) AND EARTH MOMENTARILY.
NOISE IS APPEARED OR NOT?
NO
YES
MEASURE THE VOLTAGE OF EACH PIN OF Q101
MEASURE THE VOLTAGE OF AGC TERMINAL IN TUNER (NORMAL: +3.0V-+7.6V)
NORMAL
ABNORMAL
ABNORMAL
NORMAL
MEASURE THE VOLTAGE OF EACH PIN OF Q101.
CHECK/REPLACE I101
CHECK/REPLACE I101 AND PIF AGC CIRCUIT
MEASURE THE B+ VOLTAGE OF TUNER
NORMAL
ABNORMAL
ABNORMAL
NORMAL
CHECK/REPLACE Z101 (SAW FILTER).
CHECK/REPLACE PRE-AMP CIRCUIT.
CHECK/REPLACE 12V LINE
CHECK/REPLACE TUNER

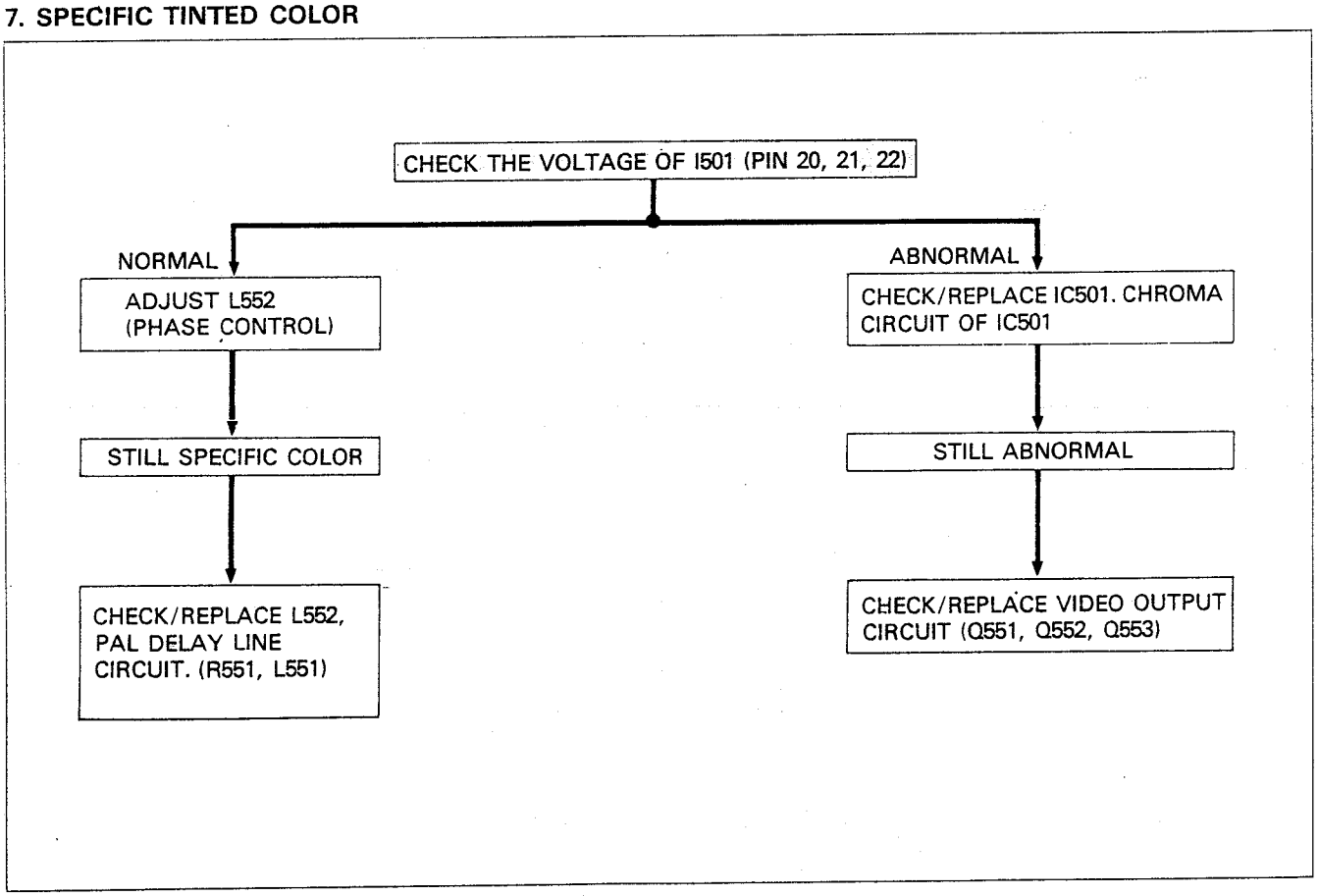
5. NO PICTURE (RASTER AND SOUND OK)


CHECK WHETHER THE BRIGHTNESS IS CONTROLLABLE OR NOT?
YES
CHECK/REPLACE THE COMPOSITE VIDEO SIGNAL INPUT STAGE AND VIDEO PARTS OF I501
NO
CHECK THE VOLTAGE OF +180V ON CRT BOARD
NORMAL
CHECK/REPLACE THE EACH PIN OF I501
STILL NO PICTURE
CHECK THE SIGNAL INPUT CIRCUIT OF I501
NORMAL
CHECK/REPLACE +12V LINE OF I101
ABNORMAL
REPLACE THE SIGNAL INPUT CIRCUIT.
ABNORMAL
CHECK/REPLACE +180V RECTIFIER CIRCUIT (D407, C427, R430, C430)
STILL ABNORMAL
REPLACE T402

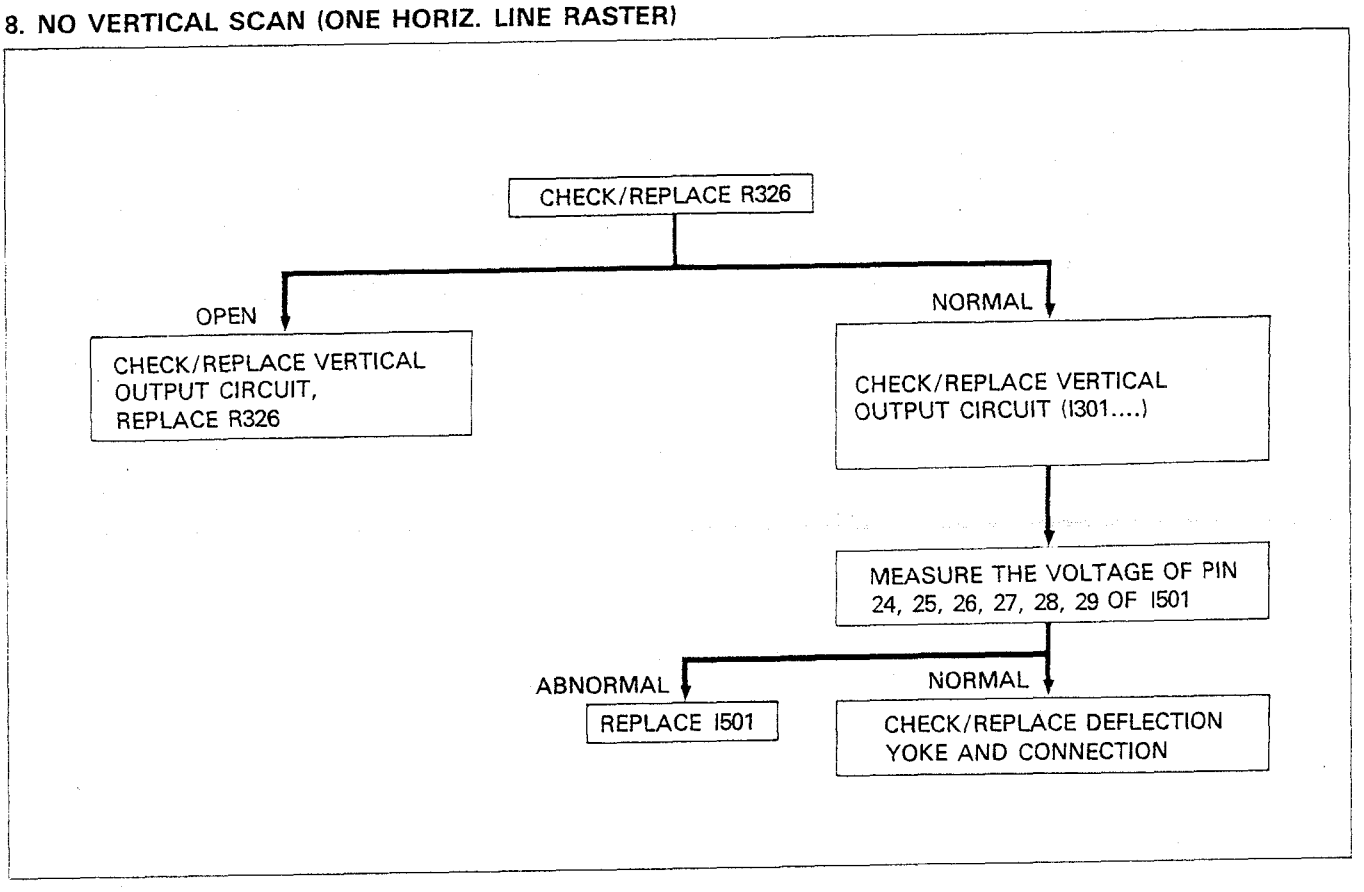
6. NO COLOR



7. SPECIFIC TINTED COLOR


CHECK THE VOLTAGE OF I501 (PIN 20, 21, 22)
NORMAL
ABNORMAL
ADJUST L552 (PHASE CONTROL)
CHECK/REPLACE IC501. CHROMA CIRCUIT OF IC501
STILL SPECIFIC COLOR
STILL ABNORMAL
CHECK/REPLACE L552, PAL DELAY LINE CIRCUIT. (R551, L551)
CHECK/REPLACE VIDEO OUTPUT CIRCUIT (Q551, Q552, Q553)

8. NO VERTICAL SCAN (ONE HORIZ. LINE RASTER)



9. OUT OF VERTICAL SYNC. AND HORIZ. SYNC

CHECK REPLACE SYNC SEPARATION CIRCUIT AND I501

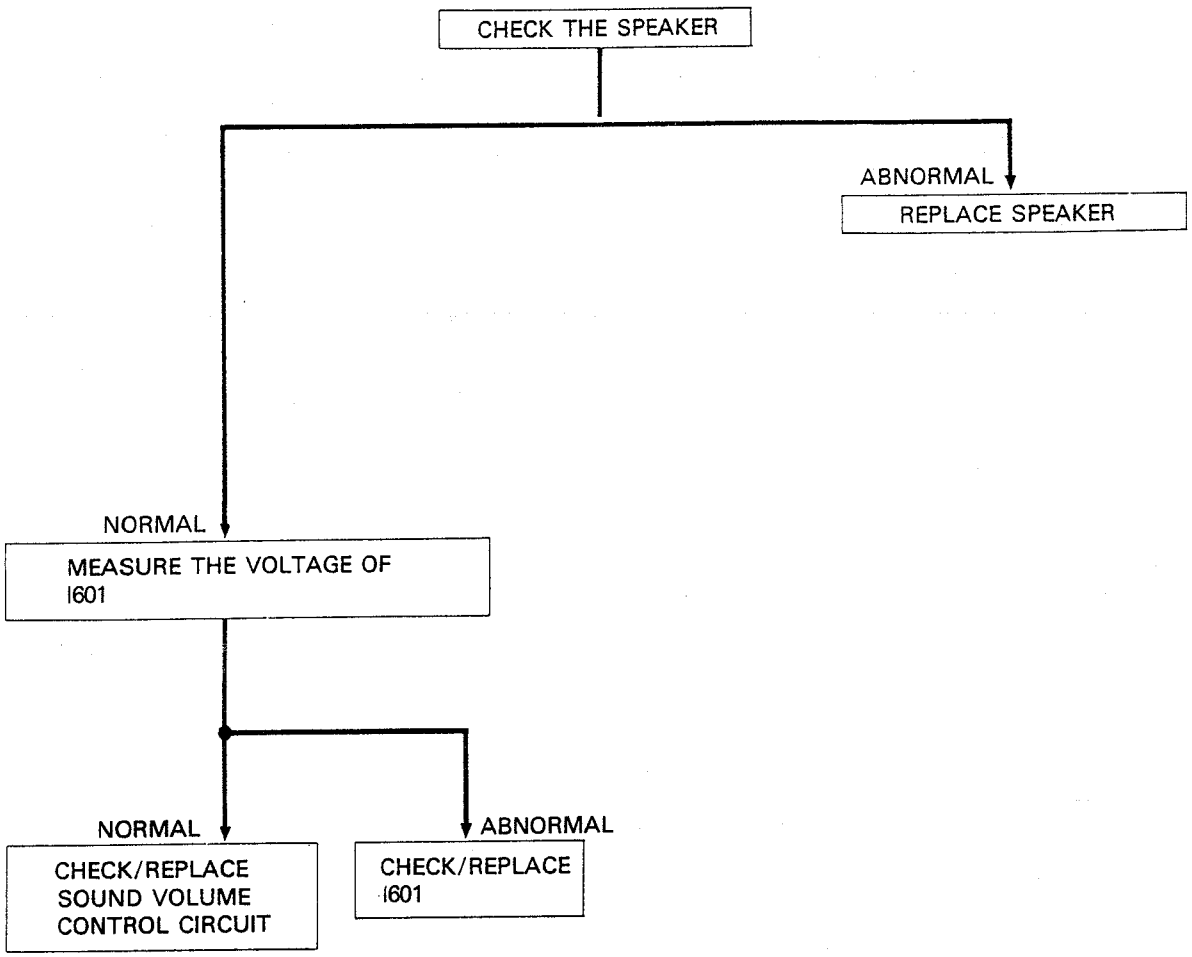
10. OUT OF VERTICAL SYNC

CHECK/REPLACE VERTICAL OSC. PARTS OF I501

11. OUT OF HORIZONTAL SYNC

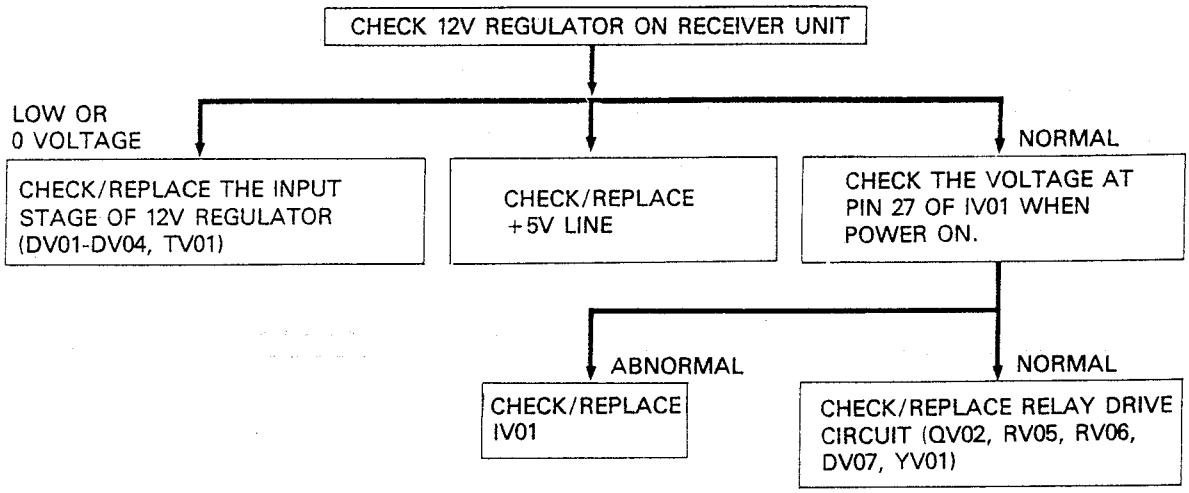
CHECK/REPLACE HORIZ. OSC PARTS OF I501, AFC CIRCUIT

12. NO SOUND

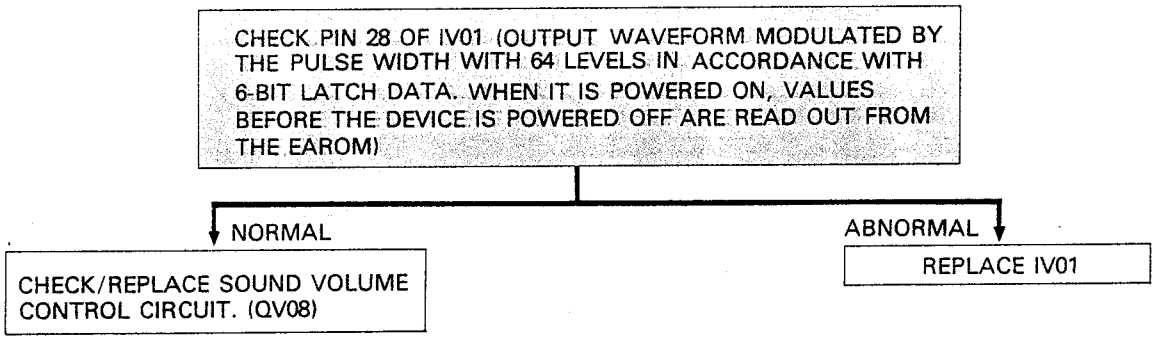

CHECK THE SPEAKER
ABNORMAL
REPLACE SPEAKER
NORMAL
MEASURE THE VOLTAGE OF I601
NORMAL
CHECK/REPLACE SOUND VOLUME CONTROL CIRCUIT
ABNORMAL
CHECK/REPLACE I601

13. RECEIVER UNIT OPERATION

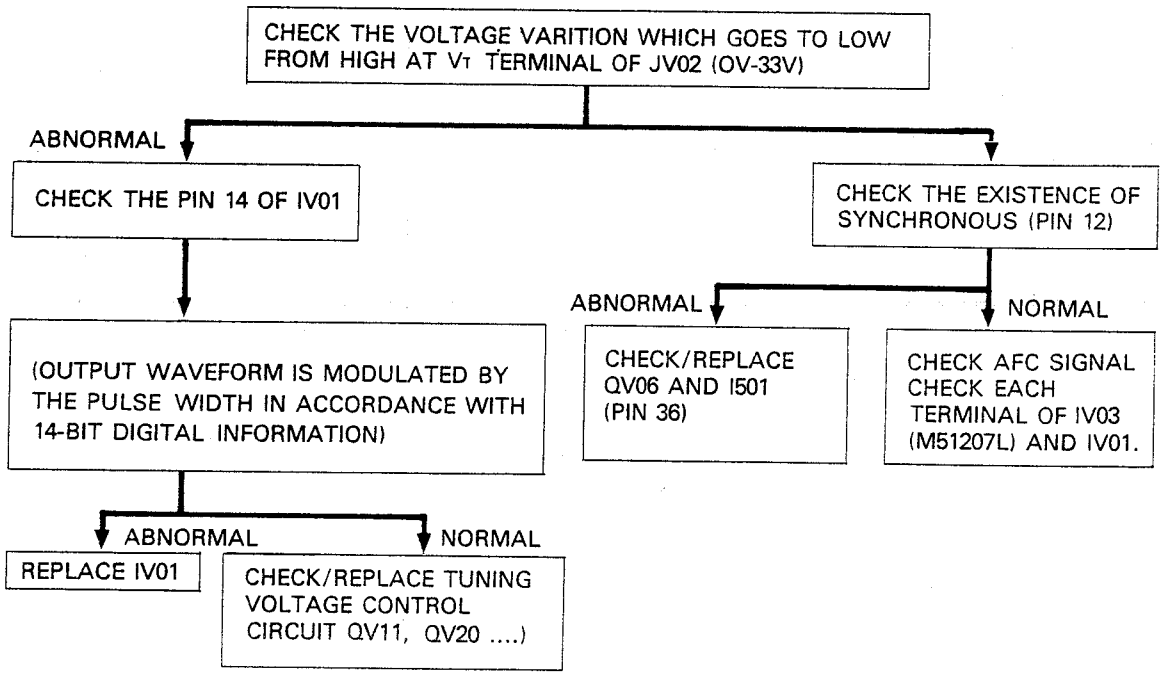
1) NO RASTER


CHECK 12V REGULATOR ON RECEIVER UNIT
LOW OR
0 VOLTAGE
CHECK/REPLACE THE INPUT STAGE OF 12V REGULATOR (DV01-DV04, TV01)
CHECK/REPLACE +5V LINE
NORMAL
CHECK THE VOLTAGE AT PIN 27 OF IV01 WHEN POWER ON.
ABNORMAL
CHECK/REPLACE IV01
NORMAL
CHECK/REPLACE RELAY DRIVE CIRCUIT (QV02, RV05, RV06, DV07, YV01)

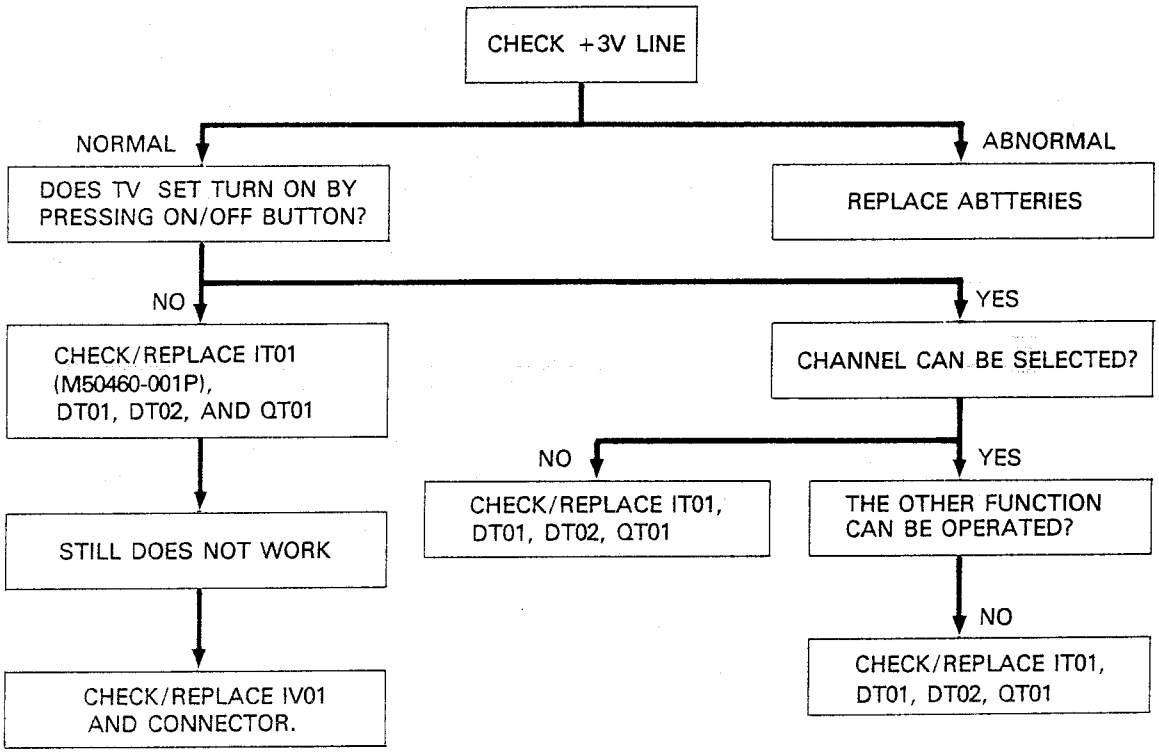
2) NO SOUND


CHECK PIN 28 OF IV01 (OUTPUT WAVEFORM MODULATED BY THE PULSE WIDTH WITH 64 LEVELS IN ACCORDANCE WITH 6-BIT LATCH DATA. WHEN IT IS POWERED ON, VALUES BEFORE THE DEVICE IS POWERED OFF ARE READ OUT FROM THE EAROM)
NORMAL
CHECK/REPLACE SOUND VOLUME CONTROL CIRCUIT. (QV08)
ABNORMAL
REPLACE IV01

3) NO AUTOMATIC SEARCH OPERATION


CHECK THE VOLTAGE VARITION WHICH GOES TO LOW FROM HIGH AT VT TERMINAL OF JV02 (OV-33V)
ABNORMAL
CHECK THE PIN 14 OF IV01
(OUTPUT WAVEFORM IS MODULATED BY THE PULSE WIDTH IN ACCORDANCE WITH 14-BIT DIGITAL INFORMATION)
ABNORMAL
NORMAL
REPLACE IV01
CHECK/REPLACE TUNING VOLTAGE CONTROL CIRCUIT QV11, QV20 ....)
CHECK THE EXISTENCE OF SYNCHRONOUS (PIN 12)
ABNORMAL
NORMAL
CHECK/REPLACE QV06 AND I501 (PIN 36)
CHECK AFC SIGNAL CHECK EACH TERMINAL OF IV03 (M51207L) AND IV01.

14. REMOTE CONTROL DOES NOT WORK



WARNING: BEFORE SERVICING THIS CHASSIS, READ THE "X-RAY RADIATION PRECAUTION", "SAFETY PRECAUTION" AND "PRODUCT SPECIFICATION NOTICE" ON PAGE 2 OF THIS MANUAL.

■ REPLACEMENT PARTS LIST

CAUTION: The shaded areas in the schmatic diagram and the parts list designate components (*) which have special characteristics important for safety and should be replaced only types identical to those in the original circuit or specified in the parts list.
Before replacing any of these components, read carfully the PRODUCT SAFETY NOTICE on page 2. Do not degrade the safety of the receiver through improper servicing.

NOTE: In the case of 20 inch the designate components (*) are used.

LOCATION	PART CODE	DESCRIPTION
TRANSISTOR		
• Q201	TKTA562TMY	KTA562TM-Y
• Q401	TKTC2482--	KTC2482
• Q101	TKTC388ATM	KTC388A-TM
• Q402	T2SD1554--	2SD1554
*• Q402	T2SD1555--	2SD1555
• QB01, QB04 QB05, QB06 QB07,QB09	TKTC1815Y-	KTC1815-Y
DIODE		
• D302, D805	DRU2------	RU-2
• D807	DSR2M-----	SR-2M
• D806, D410 D304, D406 D407, DA01 DV17	DS5295G---	S5295G
• D403	D1S1886FA-	1S1886FA
• D801, D802 D803, D804	D1S1888---	1S1888
D203, D204 D205, D206 D240, D241 D302, D305 D402, DB03	D1N4148---	1N4148
IC		
• I101	1TA7607AP--	TA7607AP
• I501	1TA7698AP--	TA7698AP
• Q801	1STR5412---	STR5412
• IB01	1M51397AP--	M51397AP
• I502	1SFC7812EC	SFC7812EC
• I601	1TDA8190---	TDA8190
CARBON FILM RESISTOR (1/6W)		
R101, RB68	RD-AZ101J-	100Ω J
R102, R112 R119, R120	RD-AZ102J-	1KΩ J
RB69, R305 R312, R305 R438, R603	RD-AZ103J-	10KΩ J

LOCATION	PART CODE	DESCRIPTION
R331, R116 R327	RD-AZ104J-	100KΩ J
R212, R116 R520	RD-AZ122J-	1.2KΩ J
R606, R523	RD-AZ123J-	12KΩ J
R409	RD-AZ124J-	120KΩ J
R415	RD-AZ133J-	13KΩ J
R506	RD-AZ152J-	1.5KΩ J
R408, R604	RD-AZ153J-	15KΩ J
R203, R210	RD-AZ162J-	1.6KΩ J
R117, R432	RD-AZ182J-	1.8KΩ J
R318, R240	RD-AZ183J-	18KΩ J
R241	RD-AZ184J-	180KΩ J
* R241	RD-AZ154J-	150kΩ J
R106, R516	RD-AZ221J-	220Ω J
R313, R605	RD-AD222J-	2.2KΩ J
R308, R502 R108	RD-AZ242J-	2.4KΩ J
R311	RD-AZ244J-	240KΩ J
R103	RD-AZ270J-	27Ω J
R608	RD-AZ271J-	270Ω J
R526, R522	RD-AZ273J-	2.7KΩ J
R518, R519 R213	RD-AZ273J-	27KΩ J
R601	RD-AZ274J-	270KΩ J
R217	RD-AZ301J-	300Ω J
R307	RD-AZ302J-	3KΩ J
R114, R207 R118	RD-AZ331J-	330Ω J
R407, R411	RD-AZ362J-	3.6KΩ J
R410, R209 RB15	RD-AZ363J-	36KΩ J
R509	RD-AZ391J-	390Ω J
R247	RD-AZ392J-	3.9KΩ J
R319	RD-AZ394J-	390KΩ J
R403	RD-AZ433J-	43KΩ J
R105	RD-AZ471J-	470Ω J
R214, R609	RD-AZ472J-	4.7KΩ J
R514	RD-AZ511J-	510Ω J

LOCATION	PART CODE	DESCRIPTION
R121	RD-AZ513J-	51KΩ J
R165, R166 R167, R242	RD-AZ560J-	56Ω J
R602	RD-AZ561J-	560Ω J
R104	RD-AZ562J-	5.6KΩ J
R304, R504	RD-AZ563J-	56KΩ J
R302	RD-AZ564J-	560KΩ J
R510	RD-AZ681J-	680Ω J
R306, R301	RD-AZ751J-	750Ω J
R248, R416	RD-AZ752J-	7.5KΩ J
R501, R515 R204, R107	RD-AZ821J-	820Ω J
R527	RD-AZ822J-	8.2KΩ J
R127, R517	RD-AZ823J-	82KΩ J
R115, R208	RD-AZ824J-	820KΩ J
R404	RD-AZ912J-	9.1KΩ J

CARBON FILM RESISTOR (1/2W, 1/4W)

R802	RD-2Z154J-	150KΩ J
R316	RD-2Z229J-	2.2Ω J
RB17, RB10	RD-4Z100J-	10Ω J
RB06, RB14 RB67	RD-4Z101J-	100Ω J
R314, R328 RB59, RB70 RB52, RB16	RD-4Z102J-	1KΩ J
RB24, RB07 RB04, RB12 RB42	RD-4Z103J-	10KΩ J
R405	RD-4Z121J-	120Ω J
RB05	RD-4Z122J-	1.2KΩ J
R215	RD-4Z123J-	12KΩ J
R329	RD-4Z133J-	13KΩ J
RB23, RB18	RD-4Z152J-	1.5KΩ J
RB39, RB40	RD-4Z154J-	150KΩ J
RB54	RD-4Z183J-	18KΩ J
R303	RD-4Z225J-	2.2KΩ J
R607	RD-4Z229J-	2.2Ω J
R440, RB99	RD-4Z243J-	24KΩ J
RB33, RB35 RB37	RD-4Z271J-	270Ω J
RB72	RD-4Z273J-	27KΩ J
RB98	RD-4Z274J-	270KΩ J
RB13	RD-4Z331J-	330Ω J
RB21, RB26 RB38, RB36 RB34, RB30	RD-4Z332J-	3.3KΩ J
RB57, RB08	RD-4Z333J-	33KΩ J
R315	RD-4Z363J-	36KΩ J
RB61	RD-4Z391J-	390Ω J
RB53, RB32	RD-4Z392J-	3.9KΩ J
R310	RD-4Z393J-	39KΩ J
RV38	RD-4Z470J-	47Ω J
RB11, RB02	RD-4Z472J-	4.7KΩ J
R413, RB09 RF02, RF03	RD-4Z473J-	47KΩ J

LOCATION	PART CODE	DESCRIPTION
R806	RD-4Z474J-	470KΩ J
R691	RD-4Z561Jp	560Ω J
RB25, RB22 RB20	RD-4Z681J-	680Ω J
RB19	RD-4Z682J-	6.8KΩ J
R330	RD-4Z821J-	820Ω J
R309	RD-4Z825J-	8.2KΩ J

R FUSIBLE

• R435	RF01Z209J-	1/1 2Ω J
• R326	RF01Z399J-	1/1 3.9Ω J
• R431	RF01Z479J-	1/1 4.7Ω J

R METAL OXIDE FILM

• R430	RS-2Z100J-	1/2 10Ω J
• R324	RS-2Z331J-	1/1 330Ω J
• R437	RS01Z240J-	1/1 24Ω J
• R219	RS02Z241J-	1/1 240Ω J
• R803	RS01Z820J-	1/1 82Ω J
• R414	RS02Z822J-	1/1 8.2KΩ J
• R804	RS02Z220J-	2/1 22Ω J
• R436	RS02Z431J-	2/1 430Ω J
• R433	RS03Z242J-	3/1 2.4KΩ J
• R406	RS03Z752J-	3/1 7.5KΩ J

SEMI FIXED RESISTOR

R412, R551	RV5417102-	B1KΩ
R451, RB76	RV5417103-	B10KΩ
R353	RV5417222-	B2.2KΩ
R352	RV5417223-	B22KΩ
R255, R152 R552	RV5417472-	B4.7KΩ

CERAMIC CAPACITOR

CB14, CB20 CF03	CCXB1H102K	50V 1000pF
C402	CCXB1H152K	50V 1500pF
CB21, CB15	CCXB1H221K	50V 220pF
CB29, CB31	CCXB1H331K	50V 330pF
CB40	CCXB1H472K	50V 470pF
C303	CCXB1H561K	50V 560pF
C414, C427	CCXB2H102K	500V 1000pF
C422	CCXB2H152K	500V 1500pF
C417, C811	CCXB2H222K	500V 2200pF
C415	CCXB2H561K	500V 560pF
C317, C308	CCXB3A102K	1KV 1000pF
C801, C802 C803, C804 CA01	CCXE2H472P	500V 4700pF

LOCATION	PART CODE	DESCRIPTION
C609, C506 C509, C510 C511, C513 C602, C603 C401, C302 C101, C102 C103, C104 C105, C106 C107, C108 C109, C110 CB50, CB34 CB35, CB32 CB19, CB11 CB04, CB08 CF01. CF02 CF04, CF05, CF06	CCXF1H103Z	50V 0.01uF
C608, C523	CCXF1H473Z	50V 0.047uF
C502	CXCH1H100D	50V 10pF
C404	CXCH1H101J	50V 100pF
C604, CB99	CXCH1H120J	50V 12pF
C512	CXCH1H121J	50V 120pF
C501	CXCH1H180J	50V 18pF
C210	CXCH1H181J	50V 180pF
C515, C516	CXCH1H200J	50V 20pF
C113, C114	CXCH1H209J	50V 2pF
C111	CXCH1H240J	50V 24pF
CB01	CXCH1H270J	50V 27pF
C517	CXCH1H300J	50V 30pF
CB12, CB13 CB17, CB18	CXCH1H390J	50V 39pF
C691, C692	CXCH1H560J	50V 56pF
CB39	CXSL1H330J	50V 33pF
C413	CXSL2H100D	500V 10pF
CA07	CCXB2L471K	AC400V 479pF

ELECTRORYTIC CAPACITOR

C318, C527 CB09	CEXE1C100A	16V 10uF
C206, C207 CB16, CB23 CB24, CB25	CEXE1C101A	16V 100uF
C321	CEXE1C222A	16V 2200uF
CB22	CEXE1C331A	16V 330uF
CB10	CEXE1C470A	16V 47uF
C615	CEXE1C471A	16V 470uF
C421	CEXE1E102A	25V 1000uF
C125	CEXE1E220A	25V 22uF
CB26, CB27 CB30, C128 C301, C331 C406, C407 C616, C613 C614, C606 C504	CEXE1H109A	50V 1uF
C309	CEXE1H229A	50V 2.2uF
C115, C204 C307, C411 C412, C514 CB33	CEXE1H478A	50V 0.47uF
CV16	CEXE1H470A	50V 47uF
CB05, C518 C612, C161 C162. 126	CEXE1H479A	50V 4.7uF
C405	CEXE1V100A	35V 10uF
C312	CEXE1V221A	35V 220uF
C428, C440	CEXE2C100A	160V 10uF
C807	CEXE2C101A	160V 100uF
C430	CEXE2C109A	160V 1uF
C429	CEXE2C109C	160V 1uF
C433	CEXF1C222A	16V 2200uF
C431	CEXF1C471A	16V 470uF
C311	CEXF1V102V	35V 1000uF
• C805	CEXS2V351D	350V 350uF
CA02	CEXE1E471A	35V 470uF

MYLAR CAPACITOR

C322, C326	CMXB2A103K	100V 0.01uF
C315, C326	CMXB2A104K	100V 0.1uF
C316	CMXB2A122K	100V 1200pF
C305	CMXB2A152K	100V 1500pF
C306	CMXB2A153K	100V 0.015uF
C426, C519 C520	CMXB2A223K	100V 0.022uF
C610	CMXB2A224K	100V 0.22uF
C408	CMXB2A302K	100V 3000pF
C304	CMXB2A333K	100V 0.033uF
C409	CMXB2A562K	100V 5600pF
C410	CMXB2A912K	100V 9100pF
C325	CXME2D394J	200V 0.39uF
* C325	CMXE2D474J	200V 0.47uF
C419	CMXH3C602J	1.6KV 6000pF
* C419	CMXH3C822J	1.6KV 8200pF

TANTALIUM CAPACITOR

C308	CTXD1V228K	35V 0.22uF
C313	CTXD1V229K	35V 2.2uF

COIL

T102	58E0000010	COIL AFT (TRF-1445A)
L402, L404	58C0000026	COIL CHOKE (HC4035)
L802	58C4790034	COIL CHOKE (TRF-9247 4.7uH)
L101	58C5580019	TRF-9225 (0.55uH)
L406	58C600K603	CH-006K (6uH)
L405	58C9430599	AZ9004Y (94uH)
L102	58C9870027	TRF-1201B (0.97uH)
X502	58Q0000029	COIL DELAY LINE (SD-11P1D)
DL01	58Q0000039	COIL DELAY LINE (4014434TS)
L552	58J0000003	COIL DEMODULATOR (TRF-5605Q)

LOCATION	PART CODE	DESCRIPTION
TB02, TB03	58N4R30007	COIL DISCRIMINATOR (TRF-363)
TB04	58N4250018	COIL DISCRIMINATOR (TRF-5425A)
L551	58F0000004	COIL FILTER (TRF-5501Q)
L403	58H0000018	COIL LINEARITY (L-125, 125uH)
* L403	58H0000016	COIL LINEARITY (L-102, 102uH)
L201	58P100J029	COIL PEAKING (10uH)
LB99	58P101J063	COIL PEAKING (100uH)
L401	58P109J001	COIL PEAKING (1uH)
L106	58P120J031	COIL PEAKING (12uH)
L105	58P139J005	COIL PEAKING (1.3uH)
L551	58P181J073	COIL PEAKING (180uH)
L601	58P220J039	COIL PEAKING (22uH)
L502	58P229J011	COIL PEAKING (2.2uH)
L501	58P330J045	COIL PEAKING (33uH)
T101	58B0000033	COIL PIF (TRF-1444Q)
TB01	58N4R30006	COIL PEAKING (TRF-364)
L651	58S5500018	COIL SIF (TRF-6703B)
L103	58T1390015	COIL TRAP (TRF-1448B)

MISCELLANEOUS

C809, C810	CLXY2LE104M	C LINE ACROSS (AC 250V, 0.1uF)
X501	5PHC18U3--	CRYSTAL (HC-18U, 4.43MHz)
Z102	5PTPS55MB-	FILTER CERA (TPS-5.5MB), (TPS-6.5MB)
Z103	5PTPS65MB	FILTER CERA (SFE-6.0MB)
T802	5PLF3138--	FILTER LINE (LF-3138)
Z101	3PF1036H--	FILTER SAW (F1036H)
• F801	5FSGB4021L	FUSE (250V, T4A)
—	4859802490	PCB MAIN
R805	DERPZ5180A	ERP-Z5BON180A
• R801	RX10T339J-	R CEMENT (10W, 3.3Ω J)
• T402	5THU000063	FBT (KFS-60226B)
*• T402	5TH1000069	FBT (KFS-60226)
T401	5TDU000007	TRANS H DRIVE (Z0001PE)
• T801	5TM0000003	TRANS SMPS (T-2)
• —	4859705930	TUNER VARACTOR (VTSA101Z)
—	5V4103025V	VR ROTARY BLOCK

LOCATION	PART CODE	DESCRIPTION

MECHANICAL PARTS

—	4857240020	SHIELD COVER
—	4857224400	SHIELD CASE
—	4857224300	SHIELD PLATE
—	4857020701	HEAT SINK A
—	4857021600	HEAT SINK B
—	4857020400	HEAT SINK
—	4857017900	HEAT SINK
—	4853034700	BRACKET FBT
—	4857415000	CLIP FUSE

■ PARTS LISTS FOR VR TUNINS ASS'Y

TRANSISTOR

• QV12, QV13 QV14, QV09 QV10	TKTA1015Y-	KTA1015-Y
• QV03, QV04 QV06, QV08 QV17	TKTC1815Y-	KTC1815-Y
• QV20, QV11	TKTC1959Y-	KTC1959-Y
• QV01, QV02	TKTC2120Y-	KTC2120-Y

DIODE

DV10	DZPD4R3---	ZPD4.3
• DV01, DV02 DV03, DV04	D1N4002---	1N4002
DV07, DV08 DV13, DV14 DV16, DV19 DV21, DV22 DV23, DV24 DV25, DV26 DV27, DV28 DV29, DV40 DV41, DV41 DV43, DV44 DV45, DV46	D1N4148---	1N4148
• DV09	DZPD7R5---	ZPD7.5

IC

• IV01	1M50431---	M50431
• IV02	1M58655P--	M58655P
• IV03	1M51207L--	M51207L
• IV04	1LA7910---	LA7910
• DV18	1UPC574J--	UPC574J

CARBON FILM RESISTOR

RV77, RV18	RD-AZ103J-	1/6 10KΩ J
RV28	RD-AZ473Jp	1/6 47KΩ J
RV34, RV35 RV36, RV37	RD-4Z102J-	1/4 1KΩ J
RV23, RV24 RV08, RV09 RV11, RV14 RV15, RV17 RV56, RV57 RV40, RV42 RV47	RD-4Z103J-	1/4 10KΩ J

LOCATION	PART CODE	DESCRIPTION
RV75	RD-4Z124J-	1/4 120KΩ J
RV58, RV59 RV60, RV61 RV63, RV64	RD-4Z151J-	1/4 150KΩ J
RV48	RD-4Z153J-	1/4 15KΩ J
RV32	RD-4Z182J-	1/4 1.8KΩ J
RV88	RD-4Z201J-	1/4 200Ω J
RV07	RD-4Z222J-	1/4 2.2KΩ J
RV25, RV26 RV27	RD-4Z223J-	1/4 22KΩ J
RV72	RD-4Z273J-	1/4 27KΩ J
RV65, RV66 RV67, RV68 RV69, RV70 RV71, RV51 RV52, RV53 RV54, RV55	RD-4Z303J-	1/4 30KΩ J
RV43	RD-4Z331J-	1/4 330Ω J
RV10, RV50	RD-4Z333J-	1/4 33KΩ J
RV22	RD-4Z363J-	1/4 36KΩ J
RV98	RD-4Z470J-	1/4 47Ω J
RV04	RD-4Z471J-	1/4 470Ω J
RV05, RV30 RV31, RV45 RV46	RD-4Z472J-	1/4 4.7KΩ J
RV73, RV29	RD-4Z473J-	1/4 47KΩ J
RV97	RD-4Z513J-	1/4 51KΩ J
RV41	RD-4Z622J-	1/4 6.2KΩ J
RV20, RV39	RD-4Z752J-	1/4 7.5KΩ J
RV76	RD-4Z753J-	1/4 75KΩ J
RV03	RD-4Z820J-	1/4 82Ω J
RV06, RV21	RD-4Z912J-	1/4 9.1KΩ J

CERAMIC CAPACITOR

CV23	CCXB1H102K	50V 1000pF
CV11	CCXB1H472K	50V 4700pF
CV01, CV02 CV03, CV04	CCXB2H102K	500V 1000pF
CV08, CV27	CCXF1H103Z	50V 0.01uF
CV24	CXCH1H220J	50V 22pF
CV18, CV19	CXCH1H300J	50V 30pF

ELECTROLYTIC CAPACITOR

CV13, CV14	CEXE1C100A	16V 10uF
CV06, CV07 CV33	CEXE1C101A	16V 100uA
CV12	CEXE1H100A	50V 10uF
CV22	CEXE1H220A	50V 22uF
CV25	CEXE1H229A	50V 2.2uF
CV05	CEXE1H331A	50V 330uF
CV16	CEXE1H470A	50V 47uF

MYLAR CAPACITOR

CV20, CV21	CMXB2A394K	100V 0.39uF

LOCATION	PART CODE	DESCRIPTION
MISCELLANEOUS		
XV01	5PHC18U4R0	CRYSTAL (4.0 MHz)
–	4859803818	PCB CH RECEIVER
• TV01	5TP0000145	TPW-2012F

■ PARTS LIST FOR CRT PCB ASS'Y

TRANSISTOR

• Q551, Q552 Q553	TKTC2482--	KTC2482

CARBON FILM RESISTOR

R555	RD-AZ121J-	1/6 120Ω J
R552, R557	RD-AZ150J-	1/6 150Ω J
R559	RD-4Z271J-	1/4 270Ω J

CARBON COMP RESISTOR

R566, R568 R570	RC-2Z332J-	1/2 3.3KΩ J

METAL OXIDE FILM RESISTOR

R567, R569 R571	RS02Z153J-	2/1 15KΩ J

SEMI-FIXED RESISTOR

R554, R559 R564	RV6117103A	B10KΩ
R560, R565	RV6117201A	B200Ω

MISCELLANEOUS

–	4859803613	PCB CRT
L551	58P181J073	COIL PEAKING (180uH)
V501	4859301530	CRT SOCKET (I-CSM6113)

■ PARTS LIST FOR TRANSMITTER ASS'Y

–	4859803527	PCB TRANSMITTER
CT01	CEXF1A470A	10V 47uF
CT02, CT03 CT04	CCXF1H103Z	50V 0.01uF
DT01, DT02	DEL1L2----	EL-1L2
DT04	D1N4148---	1N4148
• IT01	1M50460---	M50460
• QT01	TKTC2120Y-	KTC2120-Y
RT01	RD-AZ102J-	1/6 KΩ J
RT02	RD-AZ229J-	1/5 2.2Ω J
XT01	4850L00510	RESORNATOR CERA (CSB455EB)

MECHANICAL PARTS

–	4852414500	GLASS REMOCON
–	4855038109	DECO REMOCON
–	4857415700	TERMINAL BATT A
–	4857415800	TERMINAL BATT B

LOCATION	PART CODE	DESCRIPTION
—	4857517300	COVER REMOCON
—	4857517400	COVER BATTERY
—	4857919705	CONTACT RUBBER
—	4857919500	CASE REMOCON

■ PARTS LIST FOR FRONT MASK ASS'Y

	—	4852031001	MASK FRONT
*	—	4852031301	MASK FRONT
	—	4857920400	DOOR LOCK
*	4855038783	DOOR VR	
*	—	4852804900	DOOR VR
	—	4855614701	MARK COLOR
	—	4854826005	BUTTON PUSH
*	—	4854826202	BUTTON PUSH
	—	4854826004	BUTTON POWER
*	—	4854826204	BUTTON POWER
•	—	4859604842	CRT
*	—	4859603162	CRT
	—	58G0000035	COIL DEGAUSS
*	—	58G0000038	COIL DEGAUSS
	—	4853510300	STOPPER CORD

■ PARTS LIST FOR SPEAKER ASS'Y

—	4858304120	5W 80HM

■ PART LIST FOR CONTROL ASS'Y

	—	4859808014	PCB CONTROL
*	—	4859808113	PCB CONTROL
	—	4859809923	PCB LED DISPLAY
	—	DUL1241---	LED (7 SEGMENT)
	—	4859801728	PCB PREAMP
•	—	1GP1U011--	IC (PRE AMP)
	—	4859901411	CORD POWER
•	—	5440102036	SW PUSH (70050-014, ME5A)
	DC01, DC02	DKLR114E--	LED (RED)
	DC03	DKLG114E--	LED (GREEN)
	DC04	DKLY114E--	LED (YELLOW)
	SC01-SC11	5SB0101025	SW TACT (KPT-1105B)
*	SC01-SC05	5S40101504	SW TACT (KPT1104)
*	SC06-SC11	5S60102004	SW TOGGLE (KEC-10901)

■ PARTS LIST FOR BACK COVER ASS'Y

	—	4852120801	COVER BACK
*	—	4852120901	COVER BACK

■ PARTS LIST FOR PACKING ASS'Y

—	4858147900	PAD UP
—	4858024900	BOX CARTON

LOCATION	PART CODE	DESCRIPTION

■ PARTS LIST FOR TERM ANT BOARD ASS'Y

•	—	4850A00540	BOX ANT SHIELD (APSB30AMU 450U)
	—	4853618601	TERMINAL ANT

■ PARTS LIST FOR A/V ASS'Y

TRANSISTOR

•	QA12	TKTA1015Y-	KTA1015-Y
•	QA13, QA14 QA03, QA04 QA07, QA01	TKTC1815-Y	KTA1815-Y

DIODE

	DA03, DA02 DA06, DA08 DA09	D1N4148---	1N4148
	DA04	DZPD7R5---	ZPD7.5

IC

•	IC01	1TLP651---	TLP651
•	IC02	1TLP631---	TLP631
•	IC03	1MC14503B-	MC14503B

CARBON FILM RESISTOR

	RA11, RA15 RA16, RA30 RA40	RD-4Z101J-	1/4 100Ω J
	RA04	RD-4Z121J-	1/4 120Ω J
	RA13, RA10	RD-4Z132J-	1/4 1.3KΩ J
	RA12, RA08	RD-4Z133J-	1/4 13KΩ J
	RA27	RD-4Z164J-	1/4 160KΩ J
	RA07	RD-4Z201J-	1/4 200Ω J
	RA03, RA06	RD-4Z202J-	1/4 2KΩ J
	RA42	RD-4Z225J-	1/4 2.2MΩ J
	RA09	RD-4Z362J-	1/4 3.6KΩ J
	RA14, RA23	RD-4Z392J-	1/4 3.9KΩ J
	RA41	RD-4Z512J-	1/4 5.1KΩ J
	RA22	RD-4Z562J-	1/4 5.6KΩ J
	RA01	RD-4Z750J-	1/4 75Ω J
	RA02, RA05	RD-4Z912J-	1/4 9.1Ω J

CERAMIC CAPACITOR

	CA15, CA16	CCXB1H103K	50V 0.01uF
	CA05, CA99	CCXF1H103Z	50V 0.01uF

ELECTROLYTIC CAPACITOR

	CA03, CA04 CA18	CEXE1C100A	16V 10uF
	CA19, CA20	CEXE1C470A	16V 47uF

MISCELLANEOUS

—	4859810923	PCB AV

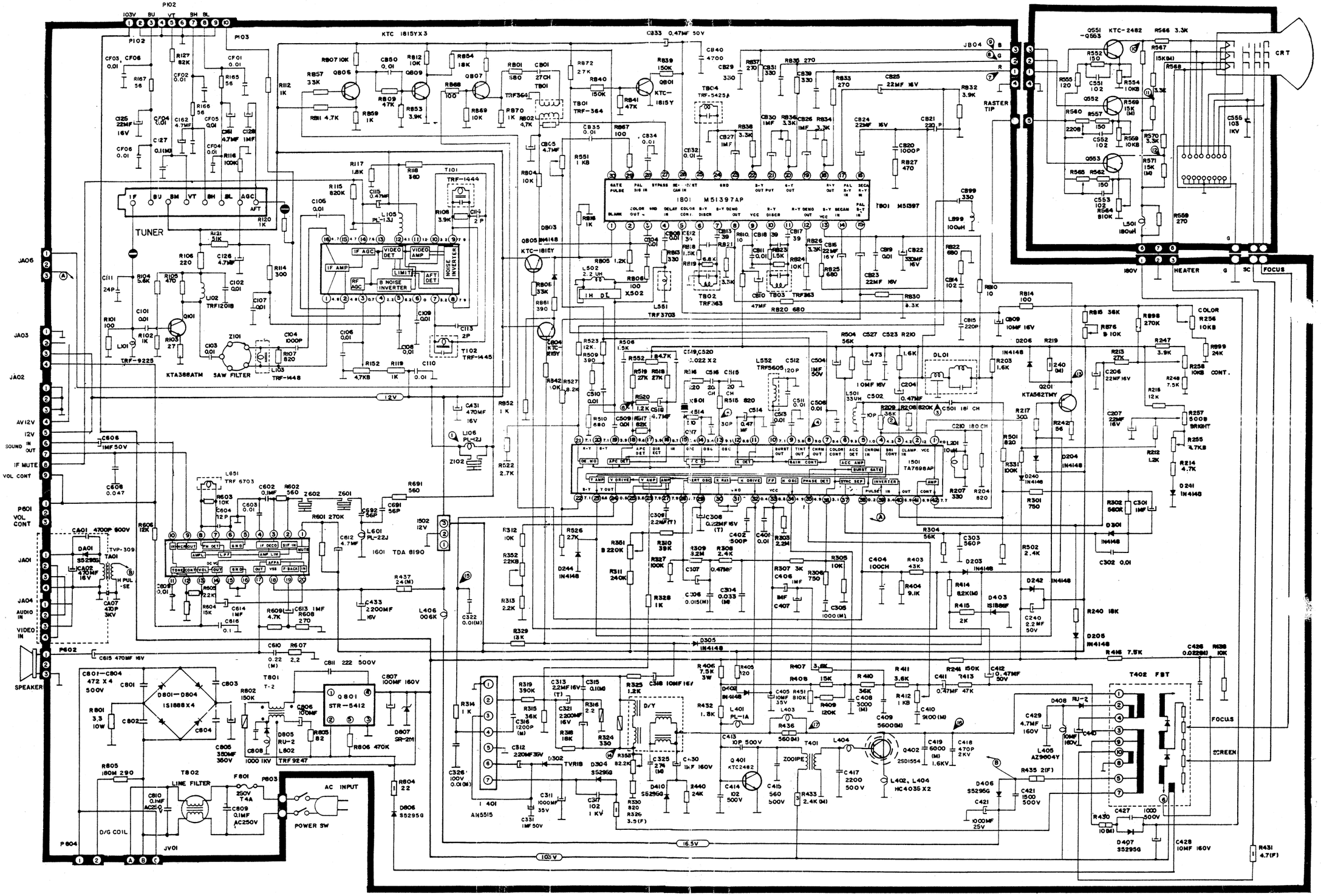
■ PARTS LIST FOR PACKING ASS'Y (20")

*	4858148000	PAD DOWN
*	4858025401	BOX CARTON

SCHEMATIC DIAGRAM

CHASSIS NO; C-41

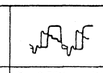
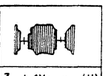
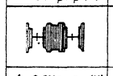
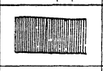
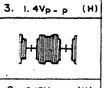
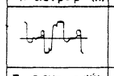
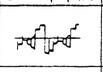
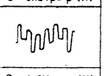
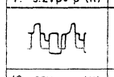
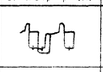
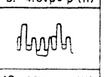
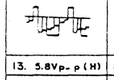
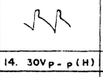
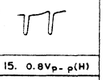
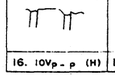
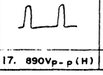
SN: 4858817719



SAFETY CAUTION :

BEFORE SERVICING THIS CHASSIS, IT IS IMPORTANT THAT THE SERVICE TECHNICIAN READ AND FOLLOW THE X-RAY RADIATION PRECAUTION, "SAFETY PRECAUTIONS" AND "PRODUCT SAFETY NOTICE" IN THE SERVICE MANUAL.

1. WAVEFORMS TAKEN USING SIGNAL FROM A STANDARD COLOR BAR GENERATOR.
2. ➤ INDICATES WAVEFORM CHECK POINTS.

1. 2.3Vp-p (H)	 2. 0.55Vp-p (H)	 3. 1.4Vp-p (H)
 4. 0.6Vp-p (H)	 5. 1.7Vp-p (H)	 6. 0.15Vp-p (H)
 7. 3.2Vp-p (H)	 8. 1.8Vp-p (H)	 9. 4.0Vp-p (H)
 10. 85Vp-p (H)	 11. 90Vp-p (H)	 12. 90Vp-p (H)
 13. 5.8Vp-p (H)	 14. 30Vp-p (H)	 15. 0.8Vp-p (H)
 16. 10Vp-p (H)	 17. 890Vp-p (H)	

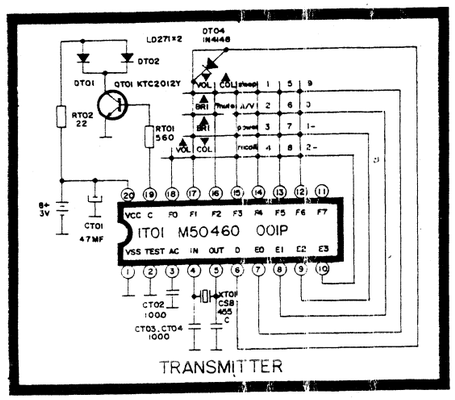
NOTES :

1. RESISTANCE VALUES ARE IN OHMS K=1000, M=1,000,000
2. CAPACITANCE VALUES 1.0 AND ABOVE ARE IN ^{PF}, THOSE BELOW ARE IN U^{F} EXCEPT AS INDICATED.
3. INDUCTOR VALUES IN U^{H} EXCEPT AS INDICATED.
4. VOLTAGES ARE MEASURED FROM CHASSIS GROUND TO POINT INDICATED WITH A "VTVM" WHILE RECEIVING A COLOR BAR SIGNAL WITH ALL CONTROLS SET TO THE MAXIMUM POSITION. (FOR A NOMINAL LINE VOLTAGE AC 110-260V, 50HZ).
5. SINCE THE CIRCUIT DIAGRAM IS A STANDARD ONE, THE CIRCUIT AND CIRCUIT CONSTANTS MAY BE SUBJECT TO CHANGE FOR IMPROVEMENT WITHOUT ANY NOTICE.

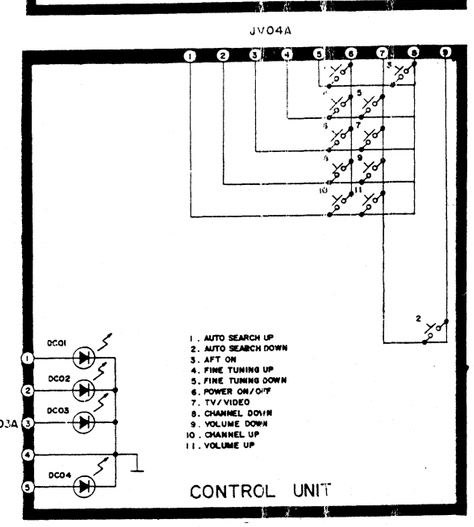
PRODUCT SAFETY NOTE :

SHADED COMPONENTS HAVE SPECIAL CHARACTERISTICS INPORTANT TO SAFETY AND SHOULD BE REPLACED ONLY WITH TYPES IDENTICAL TO THOSE IN THE ORIGINAL OR SPECIFIED IN THE PARTS LIST.
DON'T DEGRADE THE SAFETY OF THE SET THROUGH IMPROPER SERVICING.

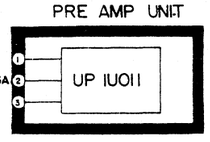
LOC.NO	14, 16 INCH	20 INCH	LOC NO	14, 16 INCH	20 INCH
Q402	2SD1554	2SD1555	R240	1/4 24K OHM	1/4 18K OHM
T402	FBT:KFS602268	KFS60266	R241	1/4 180K OHM	1/4 150K OHM
C325	0.36 200V(M)	0.47 200V(M)	C419	6000P 1.6KV(M)	8200P 1.6KV(M)
L403	L-125 125uH	L-102 102uH	CRT	14"A34JLL70X01	20"A48JLL70X02
				16"A38JLL70X01	



JV04A



PRE AMP UNIT



JV05A